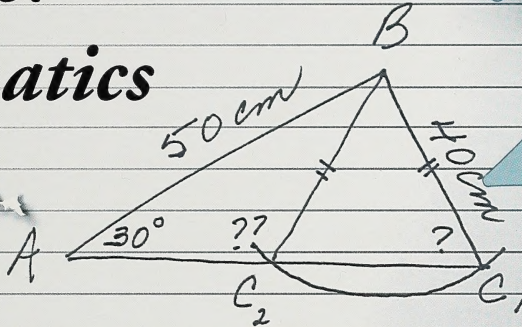


Pure MATHEMATICS

Module 1

Consumer Mathematics

20



$$\sin C = \frac{c \sin A}{a}$$

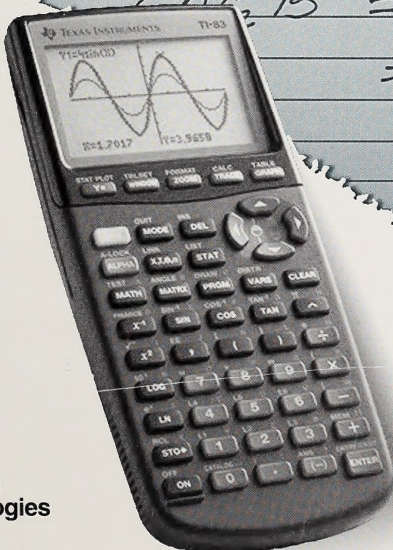
$$= \frac{50 \sin 30}{40}$$

$$\angle C = 38.7^\circ$$

$$\therefore \angle C_1 = 38.7^\circ$$

$$\angle C_2 B = 180 - \angle C_1$$

$$= 141.3^\circ$$



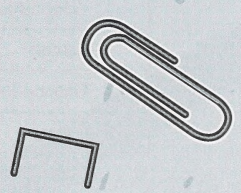


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Pure MATHEMATICS 20

Module 1 Consumer Mathematics



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LEARNING

Pure Mathematics 20
Student Module Booklet
Module 1
Consumer Mathematics
Learning Technologies Branch
ISBN 0-7741-1561-0

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Parents	
General Public	
Other	



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The address is as follows:

<http://ednet.edc.gov.ab.ca/ltb>

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Welcome



Welcome to Module 1. We hope you'll enjoy your study of Consumer Mathematics.

Pure Mathematics 20

Module 1
Consumer Mathematics

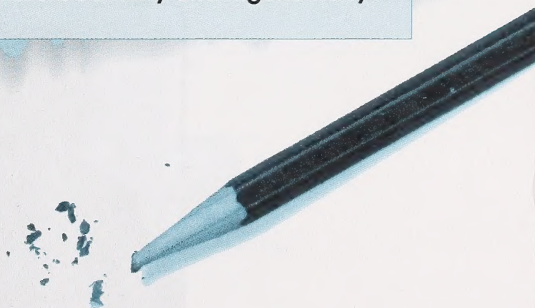
Module 2
Equations and Inequalities

Module 3
Quadratics

Module 4
Functions

Module 5
Mathematical Reasoning and Geometry

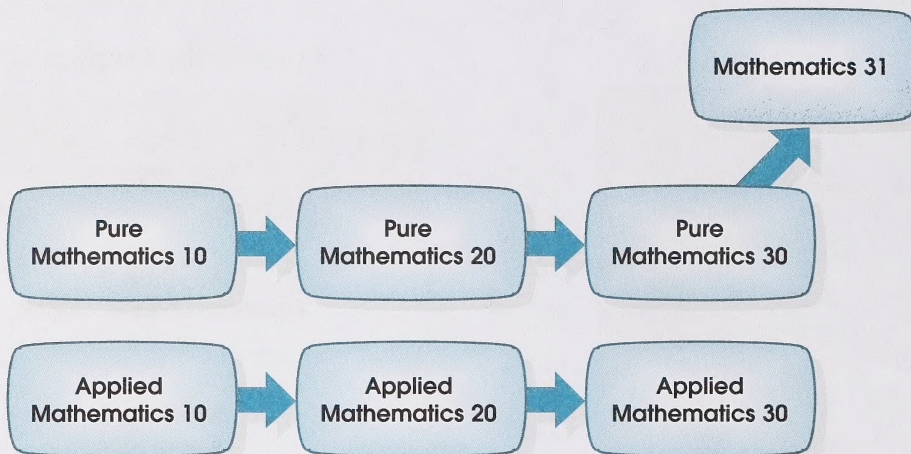
Module 6
Coordinate Geometry and Trigonometry



Pure Mathematics 20 contains six modules. Work through the modules in the order given, since several concepts build on each other as you progress in the course.

High School Mathematics Courses

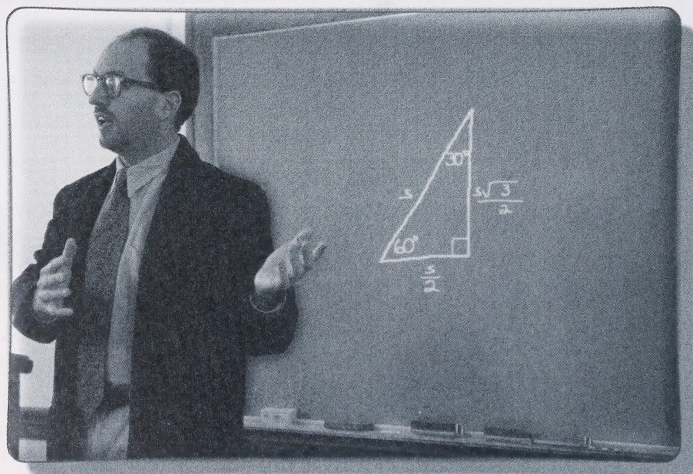
Pure Mathematics 20 is the second course in the Pure Mathematics 10–20–30 sequence of courses. Many students who take the Pure Mathematics 10–20–30 will also choose to take Mathematics 31. Another sequence of courses is Applied Mathematics 10–20–30.



How Do the Sequences Differ?

Each sequence of courses is designed for students with different mathematical strengths and interests. The Pure Mathematics 10–20–30 sequence is intended for students who are strong in mathematical theory and algebra. The Applied Mathematics 10–20–30 sequence is better suited to students who prefer to solve mathematical problems using numerical reasoning or geometry.

Each sequence of courses is designed for students with different career plans. Students who plan to take courses such as commerce, engineering, physics, and engineering technologies in post-secondary education will need to take Pure Mathematics 30 in high school. Some of these students will also need to take Mathematics 31.

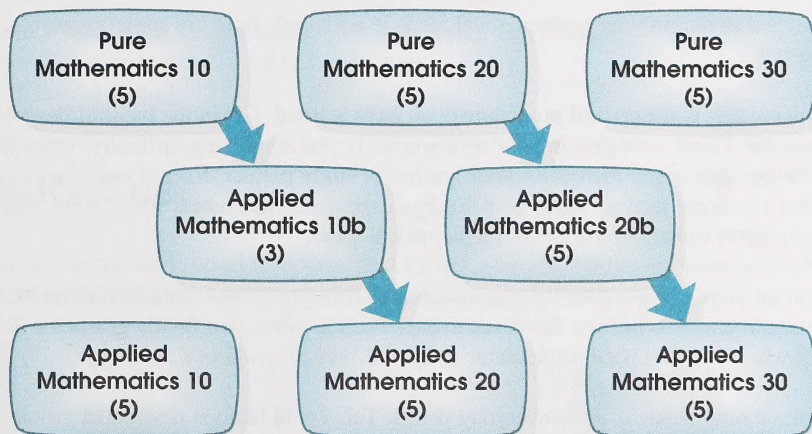


Can I Transfer to the Applied Mathematics Sequence of Courses?

You should be aware that the applied and pure mathematics courses do have some topics in common; other topics are specific to either the applied or pure mathematics courses.

Applied Topics	Common Topics	Pure Topics
- linear programming - data tables and trends - design and layout - metric and imperial measure - data presentation - vectors and matrices - periodic, fractal, and recursive patterns - financial decision making - costing and design problems	- spreadsheets - line segments and linear graphs - scaling - triangles - surveys - financial mathematics - quadratic functions - circle geometry - the bell curve	- irrational numbers - exponents - polynomial and rational expressions - mathematical expectation - growth patterns - linear and non-linear systems - operations on functions - mathematical reasoning - exponential and logarithmic functions - conics - combinations - trigonometric functions

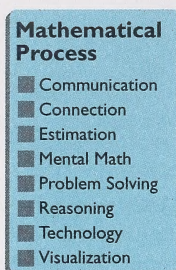
If you want to transfer from the Pure Mathematics 10–20–30 sequence to the Applied Mathematics 10–20–30 sequence at a future time, you won't have to repeat the topics that are common to pure mathematics and applied mathematics. If you decide to transfer to the Applied Mathematics sequence of courses after successfully completing Pure Mathematics 10, you may take the 3-credit course called Applied Mathematics 10b or you may take the 5-credit course called Applied Mathematics 10. If you decide to transfer after successfully completing Pure Mathematics 20, you may take the 5-credit course called Applied Mathematics 20b. The two bridging courses are shown in the following diagram:



Mathematical Processes

Throughout the course you will be expected to do the following:

- communicate mathematically
- connect mathematical ideas to everyday experiences and to concepts in other disciplines
- develop and use estimation strategies
- develop and use mental math strategies
- develop and use problem-solving strategies
- reason and justify your thinking
- select and use appropriate technologies as tools to solve problems
- use visualization to assist in processing information, making connections, and solving problems



This icon shows which mathematical process you are expected to perform.

In order to develop these mathematical processes more fully, you are encouraged to ask someone who is also taking Pure Mathematics 20 to be your study partner. You will find that having a friend to discuss mathematics with will make your studying more enjoyable.

You are also encouraged to record your mathematical ideas in a journal. Here are some suggestions for organizing your journal:

- Keep a section on new concepts and procedures you have learned. Get in the habit of describing new concepts, procedures, and strategies in your own words. If you are having difficulty, write your questions in your journal before discussing them with your teacher or study partner. Record useful ways to help you remember what a concept means. Make graphic organizers (such as context webs, Venn diagrams, or organizational charts) to help you connect mathematical ideas.
- Keep a section on your mathematical accomplishments. This can include solutions to problems that you are proud of solving. It can also include landmark events, such as when you finally grasped a difficult concept (an “aha!”) or when you first used a calculator or spreadsheet program in a new way.
- Keep a section on mathematics in the everyday world. This could include newspaper articles, cartoons, and descriptions of careers that require a mathematical background.

Resources You Will Need

In order to complete Pure Mathematics 20 successfully, you will need to have access to the following resources, which can be purchased through the Learning Resources Distributing Centre:

- the *MATHPOWER™ 11* textbook, Western Edition, published by McGraw-Hill Ryerson (1999)
- a graphing calculator

Any of the following graphing calculators may be used: *Texas Instruments* TI-83, TI-83 Plus, TI-82, TI-86, TI-89, TI-92, or TI-92 Plus; *Casio* CFX-9850Ga-Plus, CFX-9850G, CFX-9800G, or FX-9700 series; or *Sharp* EL-9600c, EL-9600, EL-9300, or EL-9200. **Note:** Some of these calculators are no longer commercially manufactured.

- a computer and a spreadsheet program

Any of the following spreadsheet programs may be used: *ClarisWorks™ 4.0* (or higher) for Macintosh, *ClarisWorks™ 4.0* (or higher) for Windows, *Microsoft® Works 3.0* (or higher) for Windows, or *Microsoft® Access 97* and *Microsoft® Excel 97* for Windows (a part of *Microsoft® Office Professional 95* or *Microsoft® Office Professional 97*).

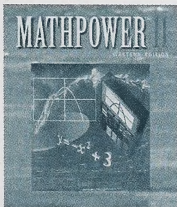
Note: Examples in this course show the TI-83 graphing calculator and the *ClarisWorks™ 4.0* spreadsheet program where applicable. If you have access to a videocassette recorder, you may wish to view the video *The TI-83 Graphing Calculator Video Tutor* to review some of the calculator's features. Check with your distance learning provider concerning the availability of this video.

Finally, you will need the following resources, which can be purchased locally:

- a mathematical instrument set (compass, protractor, ruler, and triangles)
- a binder in which to respond to the questions asked
- a binder for journal writing

Other Visual Cues

In addition to the Mathematical Process icon described earlier, you will find other visual cues throughout this course. Read the explanations given to discover what each icon prompts you to do.



Refer to the textbook.



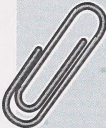
Use the Internet to explore a topic.



Answer the questions in the Assignment Booklet.

Remember: Any Internet website address given in this module is subject to change.

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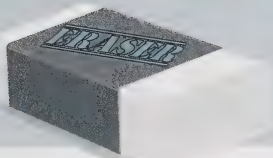
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Module Overview

Just about everyone hopes to have a job or operate a business and earn a good living so they can feel secure about the future. Earning a living gives people the means to rent an apartment or buy a house, own a vehicle, and perhaps travel to far-away, interesting places.

A study of consumer mathematics will give you a greater understanding of what to expect in the job market and what is involved when living on your own.

In this module, you will investigate earning a living and the costs associated with living independently. In Section 1, you will explore various aspects of getting paid and banking. In Section 2, you will investigate a number of costs involved with living on your own and how you can plan to live within your means.

Module 1: Consumer Mathematics

Section 1: Working and Banking



Section 2: Cost of Independence



Evaluation

The document you are presently reading is called a Student Module Booklet. It will show you, step by step, what to do and how to do it.

This module, Consumer Mathematics, has two sections. Within each section, your work is grouped into activities. Within the activities, there are readings and questions for you to answer. By completing these questions you will construct your own learning, discover mathematical connections, and practise or apply what you have learned. The suggested answers in the Appendix of this Student Module Booklet will provide you with immediate feedback on your progress.

At several points in this module you will be directed to the accompanying Assignment Booklet. In this module you are expected to complete two section assignments and one final module assignment. Your grading in this module is based upon the assignments that you submit for evaluation. The mark distribution is as follows:

Section 1 Assignment	40 marks
Section 2 Assignment	40 marks
Final Module Assignment	20 marks
TOTAL	100 marks



Strategies for Completing a Module

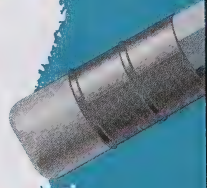
Before you begin, organize your materials: Student Module Booklet, textbook, Assignment Booklet, binder, lined paper, graph paper, graphing calculator, pens, pencils, and so on. Make sure you have a quiet area in which to work, away from distractions. Set up your time schedule.

To achieve success in this module, be sure to read all your instructions carefully and work slowly and systematically through the material. Remember, it's the work you do in this Student Module Booklet that will prepare you for your assignments and final test. Try to set realistic goals for yourself each day; and once you've set them, stick to them. Submit your assignments regularly, and don't forget to review your work before handing it in. Careful work habits will greatly increase your chances for success in Pure Mathematics 20.

Good luck!



Section 1



1





Working and Banking

Many people have a part-time or full-time job. If you have a part-time or full-time job, think about these questions. What deductions are made from your paycheque? Do you spend your earnings according to a plan or do you spend it when the need arises? Do you keep track of the money you spend? Do you save part of your earnings?

An understanding of consumer mathematics will help you make wise decisions about earning and spending, now and in the future.

In this section, you will investigate various aspects of getting paid and banking. You will discover that your net pay is not always the same as the amount you expect to be paid, and you will analyse pay stubs to see what deductions are subtracted. You will then reconcile savings accounts and chequing accounts using bank statements, solve many compound interest problems as you examine investments and loans, and discover how businesses balance cash receipts.

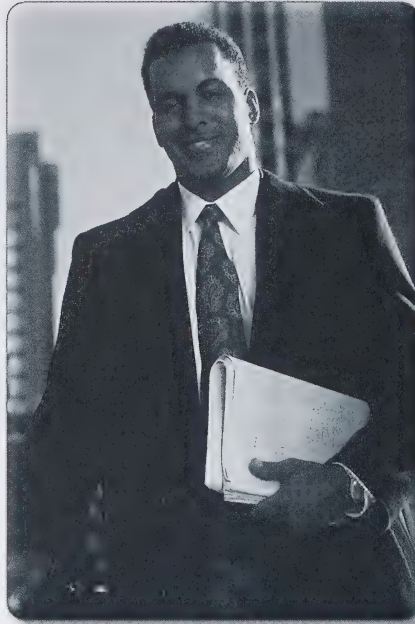


Activity 1: Earning an Income

Frank is an accountant and is paid a salary for his services. When a person receives a salary, there is usually no extra monetary compensation for working longer hours or for doing a superior job.

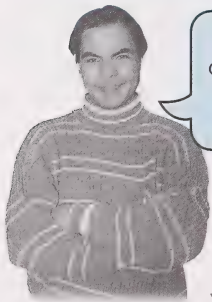
In this activity, you will examine other common methods of calculating an employee's **gross income**.

Turn to pages 528 to 530 of *MATHPOWER™ 11* and work through Examples 1 to 4.



1. a. Why do employers pay their employees time-and-a-half or even double time to work overtime?
- b. Why would the servers in a restaurant give part of their gratuities to the kitchen staff?
- c. Why is commission paid to most salespeople?
- d. Explain the advantages and disadvantages of paying employees by piecework.

Compare your responses with those in the Appendix, Section 1: Activity 1.



Now that you have an overview of the different methods of calculating an employee's gross income, you will look more closely at each method.

Recall in Example 1, on page 528 of the textbook, that Suhanna is paid an hourly rate. Her regular work week consists of 37.5 h, and she is paid straight time for these hours. Any additional hours worked in a given work week (hours worked beyond 37.5 h) are considered to be overtime hours. For these hours, she is paid time-and-a-half.

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

gross income: the amount of money earned through employment before deductions



2. Explain, in words, how time-and-a-half is calculated.
3. Turn to page 530 of *MATHPOWER™ 11* and answer questions 1, 3, and 5 of “Practice.”

Compare your responses with those in the Appendix, Section 1: Activity 1.

If you have access to the Internet, check the regulations for overtime in the Employment Standards Code in your province or territory. In Alberta, search for “Employment Standards” from the Alberta government website or go to the following website:

<http://www.gov.ab.ca/lab/what/emplstd.html>

Wage employees sometimes total their gross earnings over a certain length of time to calculate their gross weekly, monthly, or annual income. Similarly, people who are paid a salary may determine their hourly rate of pay.

4. Turn to page 530 of *MATHPOWER™ 11* and answer questions 7 and 8 of “Practice.”

Compare your responses with those in the Appendix, Section 1: Activity 1.



In many places of business, such as restaurants, employees usually receive gratuities (tips) from customers in addition to their regular hourly wage. In some businesses, tips are divided among the various employees according to a percentage allocation, as is the case in Example 2 on page 528 of the textbook.

5. Turn to pages 530 and 531 of *MATHPOWER™ 11* and answer the following:

- a. questions 9, 10, and 11 of “Practice”
- b. question 21 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 1: Activity 1.

People who work in sales may be paid in various ways. Recall in Example 3 on page 529 of the textbook that Rajan is paid entirely through commission, Eric is paid a base salary plus commission on sales above a specified amount, and Lucy is paid a graduated commission.

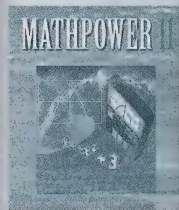
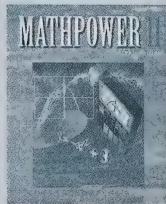
6. Turn to pages 530 and 531 of *MATHPOWER™ 11* and answer the following:

- a. questions 12, 13, 14, and 19 of “Practice”
- b. questions 23 and 24 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 1: Activity 1.



Recall in Example 4 on page 530 of the textbook that Tanya earns income by doing piecework.



7. Turn to pages 530 and 531 of *MATHPOWER™ 11* and answer the following:

- a. question 18 of “Practice”
- b. questions 22, 25, and 27 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 1: Activity 1.

Now Try This

Jonathan uses a spreadsheet program to help him with financial calculations and to graph the results of these calculations. Graphing the results presents a picture of what is occurring. This helps Jonathan interpret the results.



If you need help with setting up a spreadsheet, turn to the Appendix and review “Spreadsheets.”

8. Turn to page 531 of *MATHPOWER™ 11* and answer question 29 of “Applications and Problem Solving.” Use a spreadsheet program to graph all three plans on one set of axes. Label the x -axis “Amount (\$)” and the y -axis “Commission (\$)” Be sure to choose a reasonable step size for each axis.

Compare your responses with those in the Appendix, Section 1: Activity 1.

Looking Back

In this activity, you reviewed a number of different methods of earning income: salary, hourly rate, gratuities, commission, and piecework.

In your journal make a list of possible occupations for each method of earning income.

Activity 2: Payroll Deductions

The employment advertisements in a newspaper often give the hourly, weekly, or monthly pay prospective employees can expect to receive. The quoted figure in these advertisements is the gross income. It is not the take-home pay!

In this activity, you will analyse the various deductions taken off the gross income and calculate the **net income** for various types of employment situations.

Nelda is working as a veterinarian assistant in a local animal hospital. A sample of her statement of earnings is given.



STATEMENT OF EARNINGS

EMPLOYEE NO. 0001234		SOCIAL INSURANCE NO. 123 456 789		PAY PERIOD FROM July 16 TO July 30	
EARNINGS		RATE	UNITS	AMOUNT	
Regular		10.50	80.00	840.00	
Overtime		15.75	3.00	47.25	
DEDUCTIONS		CURRENT	YEAR TO DATE	OTHER DEDUCTIONS	AMOUNT
CPP		22.24	297.35	Group Insurance	10.01
EI		23.96	310.17	United Fund	2.25
Income Tax		219.46	2,882.66	Professional Dues	13.31
				RRSP	44.36
				Payroll Savings Plan	37.50
GROSS INCOME		TOTAL DEDUCTIONS		NET INCOME	
\$887.25		\$373.09		\$514.16	

This statement shows Nelda’s gross pay for two weeks, the **basic deductions** set by the federal government, her personal deductions, the total of all deductions, and her net pay.

Mathematical Process

- Communication
- ☒ Connection
- Estimation
- Mental Math
- Problem Solving
- Reasoning
- Technology
- Visualization

net income: the amount an employee receives after all deductions are subtracted from the employee’s gross income

basic deductions: deductions set by the federal government that include Canada Pension Plan (CPP), Employment Insurance (EI), and income tax

Use Nelda's statement of earnings to answer the following questions:

1.
 - a. List the basic deductions and calculate the total of these deductions.
 - b. What percent of Nelda's gross income are the basic deductions? Round your answer to the nearest tenth of a percent.
2. Give one reason why an employer may want to list personal deductions separately from basic deductions.
3. What other personal deductions may appear on a statement of earnings?
4. Explain, in words, how net pay is determined. Write a word formula to determine net pay.

Compare your responses with those in the Appendix, Section 1: Activity 2.

The taxes Canadian workers pay, which include visible taxes (such as federal and provincial income tax) and hidden taxes (such as those on cigarettes and gasoline), are very significant. To emphasize the amount of money paid in taxes, Tax Freedom Day was created.



Turn to page 532 of *MATHPOWER™ 11* and read "Net Income."

5. Answer the following questions on page 532 of the textbook:
 - a. question a. of "Explore: Use a Table"
Note: Explain your answer.
 - b. questions 1 and 2 of "Inquire"
6. Answer question 3 of "Inquire" on page 532 of the textbook. If possible, use the Internet to answer this question.

Compare your responses with those in the Appendix, Section 1: Activity 2.



If you complete your own tax return every year, two entries that always appear are your Canada Pension Plan (CPP) contributions and Employment Insurance (EI) premiums for the previous tax year. In most cases, your employer calculates your CPP and EI contributions for you. It is a good idea, though, to be able to calculate your CPP contributions and EI premiums yourself.

Turn to page 532 of *MATHPOWER™ 11* and read from the red line to the bottom of page 533, working through Example 1.

7. Answer questions 1 to 5, 7, 9 to 13, and 16 of “Practice” on page 536 of the textbook. Round all answers to the nearest cent.

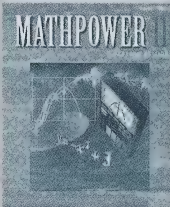
Compare your responses with those in the Appendix, Section 1: Activity 2.

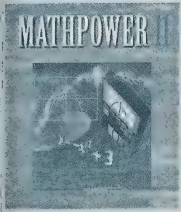
Did you know that both employees and employers have to make CPP and EI contributions? An employer’s CPP contribution matches, dollar for dollar, the employee’s contribution. For example, if \$150 is deducted from your paycheck for CPP, then your employer’s contribution would be \$150. Therefore, the total amount sent in for CPP contributions would be \$300.

The employer’s contribution to EI, however, is 1.4 times the amount of the employee’s premiums. For example, if the amount of your EI premiums for the month is \$80, then your employer would contribute $1.4 \times \$80 = \$112$. Therefore, the total premiums sent to the federal government would be $\$80 + \$112 = \$192$.

Canada Pension Plan contributions and Employment Insurance premiums are both part of the tax credits you use when calculating the amount of income tax you need to pay.

In addition, when calculating taxable income, there are a number of deductions you are allowed to make from your gross annual income. These deductions may include union dues (or professional dues), Registered Pension Plan (RPP) contributions, Registered Retirement Savings Plan (RRSP) contributions, child-care expenses, and moving expenses.



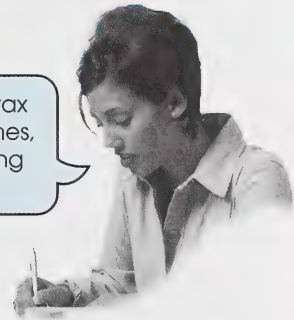


Turn to page 534 of *MATHPOWER*™ 11 and read from the top of the page to the bottom of page 535, working through Example 2.

8. Answer questions 17, 19, 21, 22, 23, 25, and 27 of “Practice” on page 536 of the textbook.
9. In your own words, explain how provincial tax is determined.
10. Answer questions 29, 31, 33, 35, and 38 of “Applications and Problem Solving” on pages 536 and 537 of the textbook. **Note:** Use the appropriate tax rate from the Federal Tax Table or Provincial Tax Table on page 534 of the textbook.

Compare your responses with those in the Appendix, Section 1: Activity 2.

If you have to determine the federal tax payable for a variety of taxable incomes, you can simplify your calculations using the following tables.



Use this table if the taxable income is between \$29 590.00 and \$59 180.00.

Taxable income Federal tax payable on <u>–29 590.00</u> Tax on the difference <u> </u> Total tax	= 5030.30 + <u> </u>
	$\times 0.26 =$

Use this table if the taxable income is over \$59 180.00. **Note:** The tax on the first \$59 180.00 is $\$29\,590.00 \times 0.17 + (\$59\,180.00 - \$29\,590.00) \times 0.26 = \$12\,723.70$.

Taxable income Federal tax payable on <u>–59 180.00</u> Tax on the difference <u> </u> Total tax	= 12 723.70 + <u> </u>
	$\times 0.29 =$

Example

Determine the federal tax for a taxable income of \$65 000.

Solution

Method 1: Using the Table

Use the second table because the taxable income is over \$59 180.

Taxable income	65 000.00		
Federal tax payable on	<u>–59 180.00</u>	=	12 723.70
Tax on the difference	5 820.00	$\times 0.29 =$	<u>+ 1 687.80</u>
Total tax			14 411.50

The federal tax is \$14 411.50.

Method 2: Using the Shortcut

$$\begin{aligned}
 \text{Federal tax} &= 12\,723.70 + 29\% \text{ of } (65\,000 - 59\,180) \\
 &= 12\,723.70 + 0.29 \times 5820 \\
 &= 12\,723.70 + 1687.80 \\
 &= 14\,411.50
 \end{aligned}$$

The federal tax is \$14 411.50.

Now Try This

Now it's time to brush up your problem-solving skills!

11. Turn to "PROBLEM SOLVING" on page 575 of *MATHPOWER™ 11* and answer questions 8 and 9 of "Using the Strategies."



Compare your responses with those in the Appendix, Section 1: Activity 2.

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☒ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization



Mathematical Process

- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Looking Back

In this activity, you calculated taxable income and net income and examined various payroll deductions, including Canada Pension Plan (CPP), Employment Insurance (EI), and income tax.

In your journal, make a list of some of the services funded by provincial and federal tax dollars.

Activity 3: Savings Accounts and Chequing Accounts

**Mathematical Process**

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

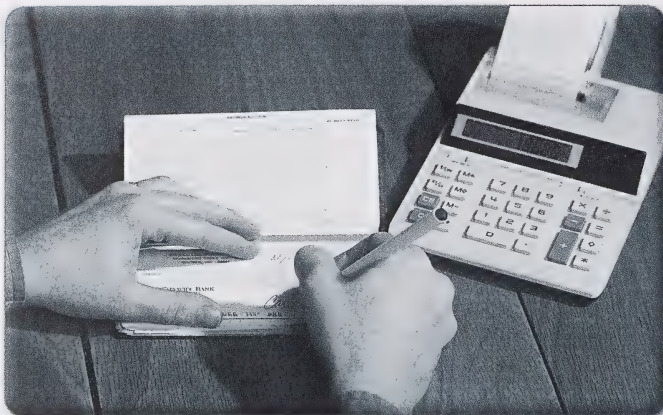
Carol is working full-time at a local department store. She has her paycheque deposited directly into her chequing account.

Each month the bank sends Carol a financial statement of all the transactions that were cleared through her chequing account for that month. This statement helps Carol keep track of her deposits and withdrawals.

1. Turn to "INVESTIGATING MATH" on page 567 of *MATHPOWER™ 11* and answer questions 1 to 5 of Investigation 1, "Understanding a Bank Statement."

Compare your responses with those in the Appendix, Section 1: Activity 3.





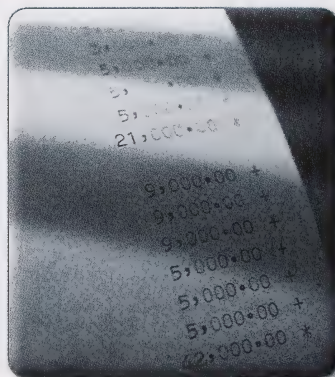
Carol has a personal chequebook and a personal transaction record book for her chequing account. Every time Carol makes a deposit or withdrawal, she records the transaction in her personal transaction record book. When Carol gets her statement from the bank, she can **reconcile** it with her personal transaction record book.

Turn to “INVESTIGATING MATH” on page 567 of *MATHPOWER™ 11* and read Investigation 2, “Reconciling a Bank Statement with a Personal Transaction Record.”

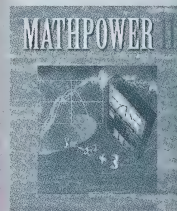
2. Answer questions 1 to 3 of Investigation 2, “Reconciling a Bank Statement with a Personal Transaction Record” on page 569 of the textbook. **Note:** The heading of the second column from the right should be called “Deposit/Credit” rather than “Payment/Debit.”
3. Carol deposited \$600.00 into her savings account, which had a previous balance of \$1344.68. If the deposit was made on the first of the month and the interest earned for the previous month was \$0.56, calculate the new balance in her savings account.

Compare your responses with those in the Appendix, Section 1: Activity 3.

Just like most people who reconcile their chequebooks with their bank statements, businesses, too, must do some reconciling. For example, a business must reconcile its cash register receipts. An employee uses the cash register to determine the total sales made during the day at that particular cash register. Then he or she reconciles the cash, cheques, credit-card receipts (such as VISA and MasterCard), and debit-card receipts (direct debit) with this total.



*reconcile: to verify
the transactions in a
personal transaction
record book with a
bank statement*



4. A total of \$1258.79 in sales was made at a particular cash register. There was originally \$50.00 in the cash register at the beginning of the day; the credit-card receipts totalled \$258.68; and the debit-card receipts totalled \$587.45. How much cash should there be in the cash register at the end of the day?

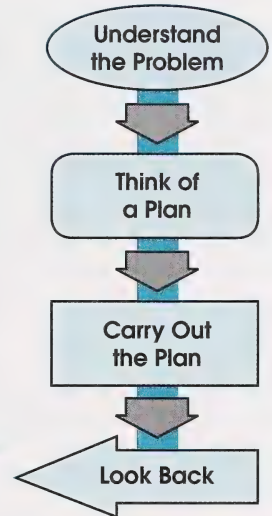
Compare your response with the one in the Appendix, Section 1: Activity 3.

Now Try This

Managing your money wisely is a practical example of the problem-solving process. Preparing budgets, projecting your financial requirements, and saving for the future involve understanding your choices, careful planning, executing your plans, and careful monitoring. These problem-solving elements not only apply to financial problems arising from living, but to more abstract mathematics.

5. Turn to "PROBLEM SOLVING" on page 575 of *MATHPOWER™ 11* and answer question 12 of "Using the Strategies."

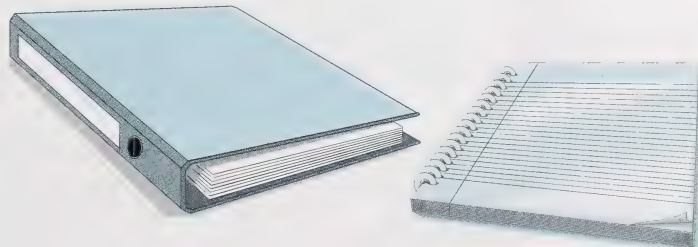
Compare your responses with those in the Appendix, Section 1: Activity 3.



Looking Back

In this activity, you investigated bank accounts.

In addition to keeping your money in a chequing account and/or a savings account, banks provide numerous other services. Visit a bank in your community and find out what other services a bank provides. Write a list of these services in your journal.



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☒ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization



Mathematical Process

- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Activity 4: Compound Interest Problems

Lyle has been working for the past year while living at home. As a result, Lyle has managed to save \$2500. Because Lyle plans to attend a university or a community college in two years, he decided to invest the money in a two-year guaranteed investment certificate (GIC).



A GIC is a conservative investment vehicle that normally bears higher interest than most savings accounts. The financial institution that issues the certificate guarantees a fixed interest rate for a specified period of time. For example, if the certificate states you will receive 5% per year over 2 years, that is precisely what you will receive. With a GIC, though, you cannot cash it in before the end of the term without penalty.

For general information on interest and on calculating interest on investments like GICs, turn to page 538 of *MATHPOWER™ 11* and read “Interest and Annuities.”

1. Answer the following questions on page 538 of the textbook:

- a. “Explore: Use a Table”
- b. questions 1 to 4 of “Inquire”

Compare your responses with those in the Appendix, Section 1: Activity 4.

Canada Savings Bonds are very similar to GICs. The Government of Canada guarantees a Canada Savings Bond just like a bank guarantees a GIC.

Canada Savings Bonds have two advantages over GICs:

- Canada Savings Bonds are purchased for a set term, but are cashable anytime with interest earned up to but not including the month in which they are redeemed. GICs can be purchased for various lengths of time but cannot be cashed before the maturity date without penalty.
- The government of Canada guarantees a minimum interest rate. However, if market conditions warrant, the government may adjust the rate upward during the term of the bonds so that holders of the bonds do not cash them in before maturity.

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

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For more information on Canada Savings Bonds, turn to page 539 of *MATHPOWER™ 11* and read from the top of the page to the middle of the page.



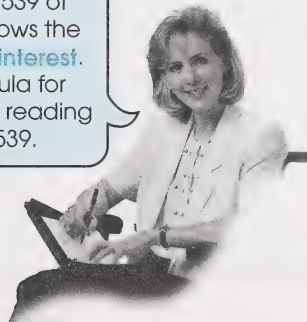
If you have access to the Internet, additional information concerning Canada Savings Bonds can also be found at the following website.

<http://www.cis-pec.gc.ca/english/csb-onln.htm>

2. Name the two types of Canada Savings Bonds and explain how they are different.
3. Study the amount columns, A, for both types of savings bonds over the eight-year period in the tables on page 539 of the textbook.
 - a. Starting in the second year, why is the amount increasing faster for the compound Canada Savings Bond?
 - b. How is this difference shown in the graph?

Compare your responses with those in the Appendix, Section 1: Activity 4.

The graph on page 539 of *MATHPOWER™ 11* shows the power of **compound interest**. Now, study the formula for compound interest by reading the rest of page 539.



When you calculate compound interest, you must consider the number of compounding periods and the interest rate per compounding period.

$$A = P(1 + i)^n$$

A = amount
 P = principal
 i = interest rate per compounding period
 n = number of compounding periods



The number of compounding periods per year can vary. The table at the bottom of page 539 of the textbook shows four common compounding periods, the number of periods in a year for each compounding period, and the interest rate for each compounding period. Notice that in order to find the interest rate per compounding period, you must divide the annual interest rate by the number of compounding periods per year.

The number of compounding periods for more than one year is equal to the number of years times the number of compounding periods per year.

Example

Sherry has an investment earning interest at a rate of 5% per annum, compounded quarterly, for 4 years.

- What is the interest rate per period?
- How many compounding periods are there?

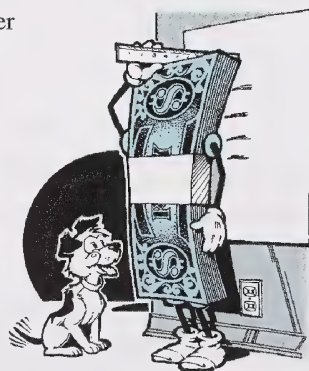
Solution

$$\begin{aligned} \text{a. } i &= \frac{5\%}{4} \\ &= 1.25\% \end{aligned}$$

The interest rate per compounding period is 1.25%.

$$\begin{aligned} \text{b. } n &= 4 \times 4 \\ &= 16 \end{aligned}$$

There are 16 compounding periods.



4. Turn to pages 542 and 543 of *MATHPOWER™ 11* and answer questions 1 to 5, 7, 9, 11, 13, and 14 of “Practice.”

Compare your responses with those in the Appendix, Section 1: Activity 4.

Now that you know about the number of compounding periods and the interest rate per compounding period, you can calculate compound interest.

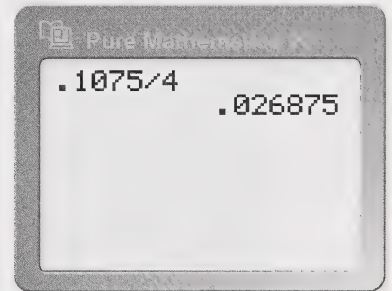
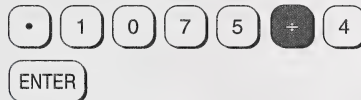


Turn to page 540 of *MATHPOWER™ 11* and work through Examples 1 and 2.

Did you understand the calculator steps in Examples 1 and 2? If not, here is an explanation of the steps in Example 1:

Step 1: Because of the rules for order of operations, the operations within the brackets are performed first. Moreover, the division within the brackets must be done before the addition.

To perform the division, press the following:

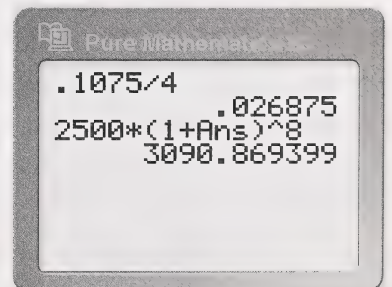


Step 2: Now, enter the terms of the entire expression in order from left to right.

When you come to the division within

the brackets, use the answer from Step 1. To do this, press **2nd** [ANS].

To enter the terms of the entire expression, press the following:



5. Answer the following question on page 543 of *MATHPOWER™ 11*.
 - a. questions 18, 19, 21, 23, and 25 of “Practice”
 - b. questions 29 and 33 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 1: Activity 4.

Comparing Investments and Loans

At one financial institution, Ruth is able to secure a 1-year loan of \$1000 at an interest rate of 8.25% per annum, compounded monthly. Another financial institution offers the same loan at an interest rate of 8.3% per annum, compounded semi-annually. Which loan is less expensive?

To determine the answer to this question, you need to determine the *effective rate of interest* for each loan.

Turn to page 547 of *MATHPOWER™ 11* and read “Effective Annual Rate of Interest.”

6. Answer the following questions on page 547 of the textbook:
 - a. “Explore: Use a Table”
 - b. questions 1 to 4 of “Inquire”
7. Do you think an effective annual interest rate like the one in question 4 of “Inquire” would be tolerated today?
8. Explain, in words, how to calculate the effective annual rate of interest.

Compare your responses with those in the Appendix, Section 1: Activity 4.



the simple interest rate that produces the same amount of interest as the compound interest rate



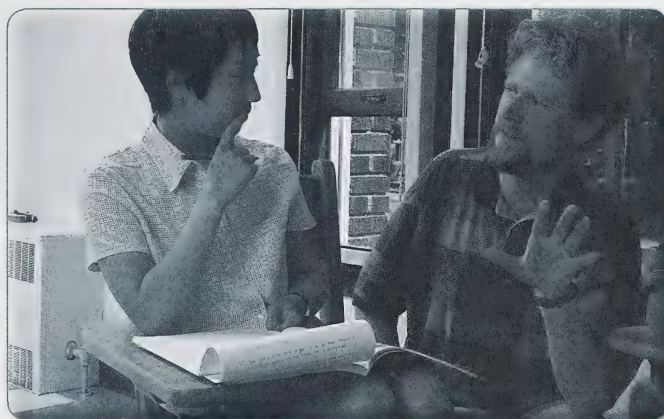
Since interest rates for loans and investments have various compounding periods, it is useful to compare the effective annual interest rates when deciding which loan or investment is better.



Turn to pages 548 and 549 of *MATHPOWER™ 11* and work through Examples 1 and 2.

9. Answer the following questions on pages 549 and 550 of the textbook:
 - a. questions 1, 2, 3, 8, and 10 of “Practice”
 - b. questions 11, 12, and 17 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 1: Activity 4.

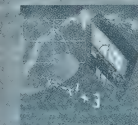


Working backwards is a strategy that is often used in problem solving. When working backwards, start with an answer and work back to find a piece of information. For example, you can use an effective annual interest rate to determine the nominal interest rate.

10. Turn to page 550 of *MATHPOWER™ 11* and answer question 20 of “Applications and Problem Solving.”

Compare your response with the one in the Appendix, Section 1: Activity 4.

MATHPOWER™



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☒ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

MATHPOWER™



Now Try This

Have you heard of the “Rule of 72”? It is a quick way that many people in the investment community use to mentally calculate how long it would take an investment, at a given compound interest rate, to double in value. For example, at an annual rate of 9%, an investment takes about 8 years to double.

$$72 \div 9 = 8$$

time to double

annual interest rate

At an annual rate of 12%, the same investment would double in value in about 6 years.

$$72 \div 12 = 6$$

time to double

annual interest rate

Being able to do mental arithmetic is an advantage when handling your money in daily transactions and in planning for the future. Now, it's time to brush up on your mental math skills.



11. Turn to page 525 of *MATHPOWER™ 11* and answer questions 1, 3, 5, 7, 9, 11, 13, 15, and 17 of “Mental Math.”

Compare your responses with those in the Appendix, Section 1: Activity 4.

Looking Back

In this activity, you analysed and calculated compound interest. In your investigation, you distinguished between nominal and effective interest rates.

Suppose one of your friends has just started a new job in another city. In your journal, write a letter persuading him or her to begin a regular savings plan. Mention the power of compound interest and illustrate it with an example showing how his or her money will grow. You may wish to include figures indicating what the amount will be at specific times using current interest rates.

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☒ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

MATHPOWER™ 11



Mathematical Process

- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Activity 5: More Compound Interest Problems

You can use spreadsheets to solve problems involving compound interest.



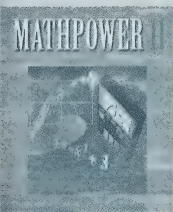
Previously, in this section, you completed the table in “Explore: Use a Table” on page 538 of *MATHPOWER™ 11*. There, you used your graphing calculator to obtain the entries. However, you could have used a spreadsheet to perform the calculations.

	A	B	C	D
1	Year	Principal (\$) (at the beginning of the year)	Interest Rate (%)	Amount (\$) (at the end of the year)
2	1	1000.00	5.5	1055.00
3	2	1055.00	5.5	1113.03
4	3		5.5	
5	4		5.5	
6	5		5.5	
7	6		5.5	

Note: If you need additional information on spreadsheets, turn to the Appendix and review “Spreadsheets.”

1. Answer the following questions concerning the preceding spreadsheet:
 - a. Since the principal at the beginning of year 3 is the same as the amount at the end of year 2, what formula should you enter in cell B4?
 - b. What formula should you enter in cell D4?
 - c. If you tried to take a shortcut by copying the formula in D3 and pasting it in D4, would the spreadsheet program automatically adjust the formula for the new row number?

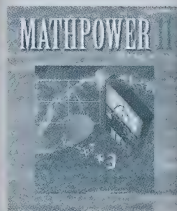
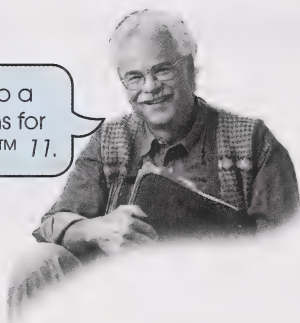
Compare your responses with those in the Appendix, Section 1: Activity 5.



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Here is an explanation of how to set up a spreadsheet to perform the calculations for Example 1 on page 540 of MATHPOWER™ 11.



Step 1: Enter the headings and the data given in a spreadsheet.

Note: Refer to “Spreadsheets” in the Appendix concerning formatting cells for \$ and % symbols.

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$2,500.00		
4	Interest Rate per Annum	10.75%		
5	Interest Rate Per Period	2.69%		
6				
7	Period	Principal	Interest	Amount
8	1	\$2,500.00		
9	2			
10	3			
11	4			
12	5			
13	6			
14	7			
15	8			

Step 2: Enter the values for the first interest period. Format cells wherever calculations occur.

- In cell B8, enter “=B3” to transfer the principal.
- In cell C8, enter “=B8*\$B\$5” to calculate the interest charged during this period. **Note:** Inserting the dollar signs within the cell name allows you to copy and paste the formula without that particular cell address changing.
- In cell D8, enter “=B8+C8” to calculate the amount owing on the loan.

Step 3: Enter the values for the second interest period. Again, format cells whenever calculations occur.

- In cell B9, enter “=D8”.
- In cell C9, enter “=B9*\$B\$5”.
- In cell D9, enter “=B9+C9”.

Step 4: Complete the table. Highlight cells B9 to D15; then from the Calculate menu, select “Fill Down.”

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$2,500.00		
4	Interest Rate per Annum	10.75%		
5	Interest Rate Per Period	2.69%		
6				
7	Period	Principal	Interest	Amount
8	1	\$2,500.00	\$67.19	\$2,567.19
9	2	\$2,567.19	\$68.99	\$2,636.18
10	3	\$2,636.18	\$70.85	\$2,707.03
11	4	\$2,707.03	\$72.75	\$2,779.78
12	5	\$2,779.78	\$74.71	\$2,854.49
13	6	\$2,854.49	\$76.71	\$2,931.20
14	7	\$2,931.20	\$78.78	\$3,009.98
15	8	\$3,009.98	\$80.89	\$3,090.87

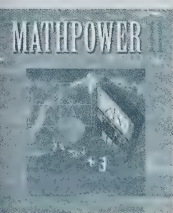
2. Turn to page 543 of *MATHPOWER™ 11* and answer the following using a spreadsheet:

- questions 20 and 22 of “Practice”
- question 33 of “Applications and Problem Solving”

Note: Always save your spreadsheets.

Note: Question 33.b. will demonstrate the power of the spreadsheet. Use your spreadsheet from question 22 and simply change the principal in cell B3, the interest rate per annum in cell B4, and the formula for calculating the interest rate per period in cell B5; then insert (using the Fill Down feature) or delete the necessary rows to get the specified number of periods.

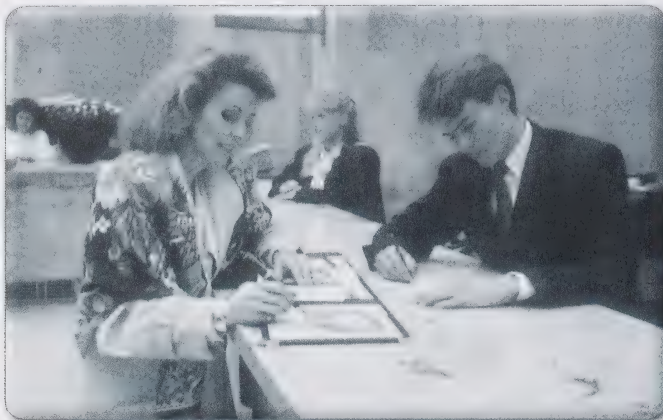
Compare your responses with those in the Appendix, Section 1: Activity 5.



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

In order to buy a car, Jennifer took out a bank loan. She agreed to make monthly payments of \$400 to the bank until the loan is paid off. The loan payments can be considered an **annuity**.



SCOTIABANK

Turn to “TECHNOLOGY” on page 546 of *MATHPOWER™ 11* and create the spreadsheet in Investigation 1, “Annuity Remaining.”

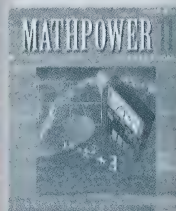
Your spreadsheet should be similar to the following.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	12,000.00	110.00	400.00	11,710.00
3	2	11,710.00			

- Use the spreadsheet you have created to answer question 1 of Investigation 1, “Annuity Remaining” on page 546 of the textbook.
- How much of the annuity remains after two years of payments have been made?
- How many periods will it take Anita to pay off the loan, assuming the interest rates and the payments do not change? Approximately how many years is this? What will be Anita’s final payment?

Note: Always save your spreadsheet.

annuity: a sequence of equal payments made at equal intervals of time



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Compare your responses with those in the Appendix, Section 1: Activity 5.



Registered Retirement Saving Plans (RRSPs) are government-approved plans that allow savings for retirement. The contributions to RRSPs are tax-deductible. Also, RRSPs allow the savings to grow tax-sheltered within the plan.

Sometimes a retiree chooses to hand over the proceeds of his or her RRSP to an annuity provider who agrees to pay the retiree a regular income.

Example

Henrietta has retired and wants to convert her RRSP to an annuity. If she has \$100 000 in her RRSP and converts it to an annuity earning 4.5% per annum, compounded monthly, with a life of 10 years, what are the monthly payments she will receive?

Solution

Use the spreadsheet from the answer to question 4 and change the cells in the first two lines as follows:

Step 1: Change the opening balance in cell B2 to \$100 000, the interest rate in cell C2 to 4.5% (or 0.045), and the payment in cell D2 to \$500.

Step 2: Copy and paste cell C2 into C3.



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Step 3: In 10 years of monthly payments and interest compounded monthly, there are $12 \times 10 = 120$ periods. Therefore, select cells A3 to E121 and use the Fill Down feature from the Calculate menu.

Your spreadsheet will look similar to the following. **Note:** To save space, rows 6 to 116 are not shown.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	100,000.00	375.00	500.00	99,875.00
3	2	99,875.00	374.53	500.00	99,749.53
4	3	99,749.53	374.06	500.00	99,623.59
5	4	99,623.59	373.59	500.00	99,497.18
...					
117	116	82,068.76	307.76	500.00	81,876.45
118	117	81,876.45	307.04	500.00	81,683.48
119	118	81,683.48	306.31	500.00	81,489.80
120	119	81,489.80	305.59	500.00	81,295.38
121	120	81,295.38	\$04.86	500.00	81,100.24

Step 4: Notice that at \$500 per month for 10 years, Henrietta will still have over \$80 000 left in the annuity. Try replacing cell D2 with increasing amounts until the value in cell E121 is less than \$1.00.

Your final spreadsheet should look similar to the following. **Note:** To save space, rows 6 to 116 are not shown.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	100,000.00	375.00	1,036.38	99,338.62
3	2	99,338.62	372.52	1,036.38	98,674.76
4	3	98,674.76	370.03	1,036.38	98,008.41
5	4	98,008.41	367.53	1,036.38	97,339.56
...					
117	116	5,124.72	19.22	1,036.38	4,107.55
118	117	4,107.55	15.40	1,036.38	3,086.58
119	118	3,086.58	11.57	1,036.38	2,061.77
120	119	2,061.77	7.73	1,036.38	1,033.12
121	120	1,033.12	3.87	1,036.38	0.62

Henrietta will receive payments of \$1036.38 per month.

Mathematical Process

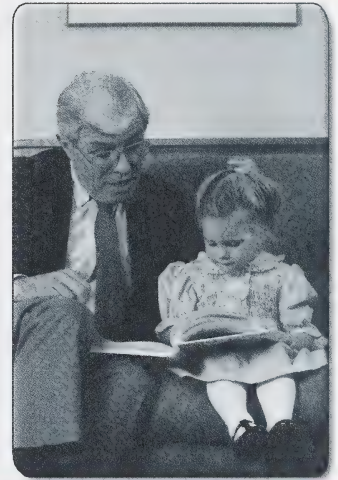
- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

MATHPOWER

6. Answer the following questions concerning Henrietta's annuity:
 - a. Suppose Henrietta had been able to invest the \$100 000 in an annuity at 9.50% per annum, compounded monthly. What amount of the annuity would be remaining after 10 years if the payments were kept the same?
 - b. Write the steps you followed to answer question 6.a.
 - c. Determine the amount of the monthly payment that can be paid from the annuity at 9.50% per annum, compounded monthly, over 10 years.

 7. Turn to "TECHNOLOGY" on page 546 of *MATHPOWER™ 11* and answer questions 1.a. and 1.c. of Investigation 2, "Annuity Payments."

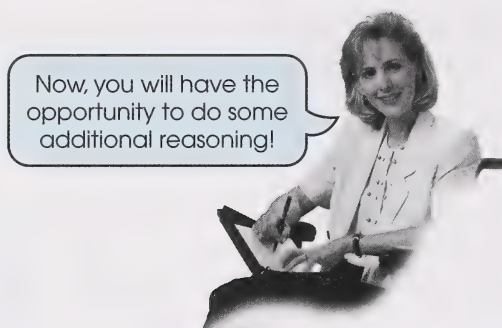
 8. Turn to page 543 of *MATHPOWER™ 11* and answer questions 36 and 37 of "Applications and Problem Solving" using a spreadsheet. Explain, in words, how you altered the spreadsheet from question 2 of this section to do this question.
- Note: Rate of inflation is the rate at which the average cost of goods and services increase in a year.*
9. Theodore is setting up a trust account for his granddaughter's future education. He invests an initial \$1000 and then \$1000 every year in compound Canada Savings Bonds that earn 6.25% per annum, compounded annually.
 - a. How much will be in the account after 18 years?
 - b. If Theodore could invest only at 4.75% per annum, compounded annually, how much will be in the account after 18 years?
 - c. How much more is the amount of the investment at 6.25% than at 4.75%?



Compare your responses with those in the Appendix, Section 1: Activity 5.

Now Try This

Working with spreadsheets involves logical reasoning. You must determine how the cells of a row are related and how the rows are related in your program. If there is a flaw in your reasoning, the entries you obtain in the cells will usually indicate your error immediately. Errors, too, are useful in guiding you towards a correct solution.



10. Turn to “PROBLEM SOLVING” on page 575 of *MATHPOWER™ 11* and answer question 1 of “DATA BANK.” Use the data bank “Canadian Population Projections by Age Group” on page 583 of the textbook.
11. Turn to page 527 of *MATHPOWER™ 11* and answer the following:
 - a. questions a. and b. of “Explore: Interpret the Graph”
 - b. questions 1 and 2 of “Inquire”

Compare your responses with those in the Appendix, Section 1: Activity 5.

Looking Back

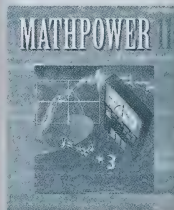
In Activity 4, you worked through Example 1 on page 540 of the textbook using a graphing calculator. In this activity, you worked through the same example using a spreadsheet program.

In your journal, answer the following questions:

- Which method provided you with the answer more quickly?
- What is the advantage of using a spreadsheet program rather than a graphing calculator?

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization



Mathematical Process

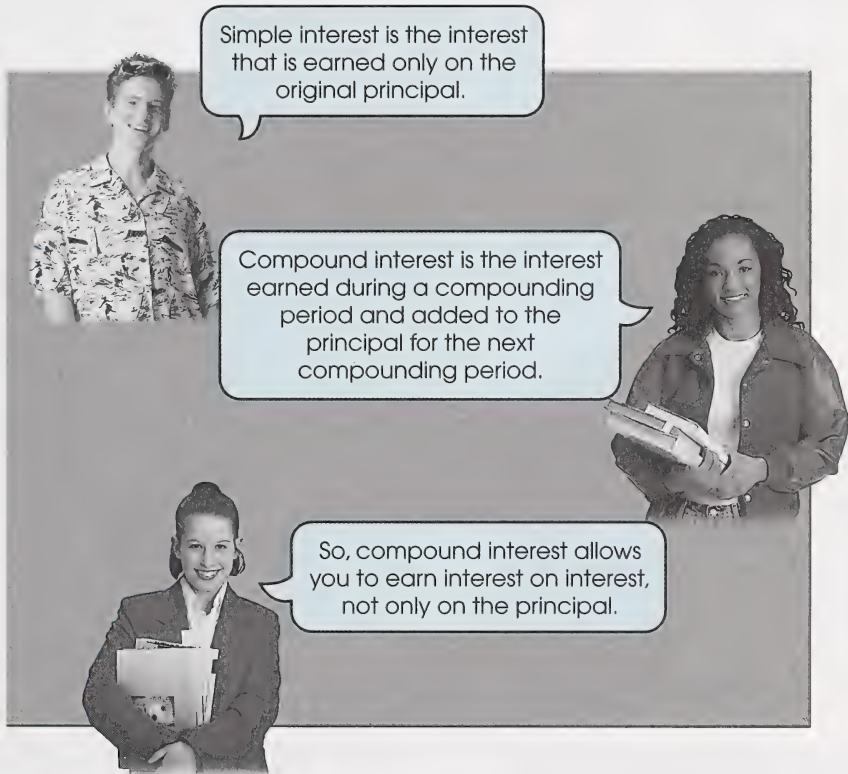
- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Follow-up Activities

If you had difficulties understanding the concepts and skills in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts and skills, it is recommended that you do the Enrichment. You may decide to do both.

Extra Help

In this section, you worked with simple interest and compound interest.



The next example will show you how the compound interest formula was derived.

Example

What is the value of a \$500 investment after 7 years if the interest rate is 8% per annum, compounded annually.

Solution

The formula for simple interest is $I = Prt$, where I is the amount of interest, P is the principal, r is the interest rate, and t is the time period.

After one year, the accumulated amount, A , of an investment is equal to the principal plus the interest. This is given by the following formula:

$$\begin{aligned} A &= P + I \\ &= P + Prt && \leftarrow \text{Substitute } Prt \text{ for } I. \\ &= P(1 + rt) && \leftarrow \text{Factor.} \end{aligned}$$

After the first year, the amount is

$$\begin{aligned} A &= 500(1.08) \\ &= 500(1.08)^1 \end{aligned}$$

After the second year, the amount is

$$\begin{aligned} A &= 500(1.08)(1.08) \\ &= 500(1.08)^2 \end{aligned}$$

After the third year, the amount is

$$\begin{aligned} A &= 500(1.08)(1.08)(1.08) \\ &= 500(1.08)^3 \end{aligned}$$

Using the pattern from the first three years, the accumulated amount, A , after 7 years is

$$\begin{aligned} A &= 500(1.08)(1.08)(1.08)(1.08)(1.08)(1.08)(1.08) \\ &= 500(1.08)^7 \end{aligned}$$

This pattern can be used to derive the compound interest formula, $A = P(1 + i)^n$, where A is the accumulated amount, P is the principal, i is the interest rate per compounding period, and n is the number of compounding periods.

Turn to page 572 of *MATHPOWER™ 11* and answer questions 13, 15.a., and 18 of “Review.”

Compare your responses with those in the Appendix, Section 1: Follow-up Activities, Extra Help.

Enrichment

To calculate loan payments or amounts of investments, you can use the Financial features on your graphing calculator.

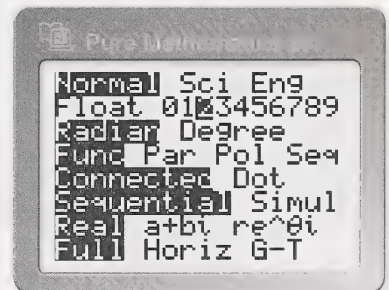
Turn to “TECHNOLOGY” on page 544 of *MATHPOWER™ 11* and read “Financial Calculations Using a Graphing Calculator.”

Example 1

Elizabeth invested \$4000 into an education fund for her grandson’s future education as soon as he was born. If the investment earns an average 4.5% per annum, compounded quarterly, how much will the investment be worth in 18 years?

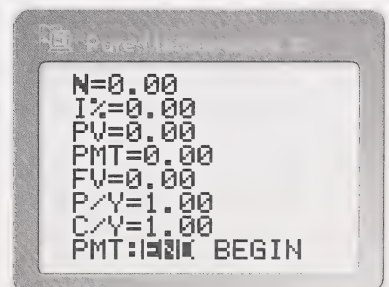
Solution

Step 1: Set the mode to 2 decimal places.



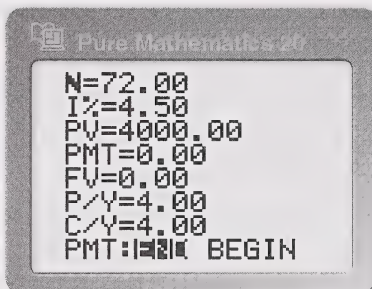
Step 2: Select the Financial features.

2nd [FINANCE] 1
(1:TVM Solver...)

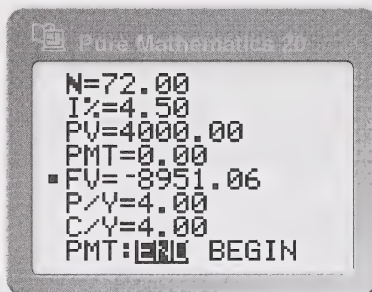


Step 3: Enter the values, pressing **ENTER** after each. Make sure “END” is highlighted at the bottom of the display.

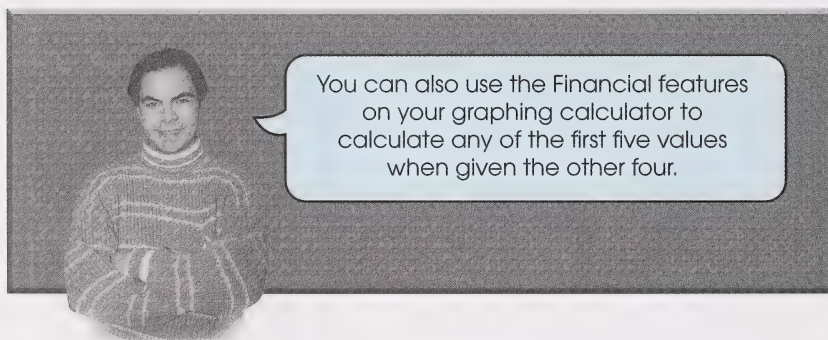
Note: The interest rate entered is the annual interest rate. This is because the calculator converts the annual interest rate to the interest rate per period.



Step 4: Move the cursor to the future value, “FV= 0.00,” and press **ALPHA** **[SOLVE]**.



Therefore, the investment will be worth \$8951.06 in 18 years.



Example

- At what annual rate of interest, compounded quarterly, would Elizabeth have to invest the \$4000 if she wants to have \$12 000 in the account after 18 years?
- How much money would Elizabeth have to invest at a rate of 8.75% per annum, compounded quarterly, if she wanted \$12 000 after 18 years?

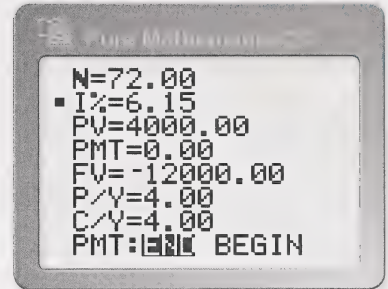
Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Solution

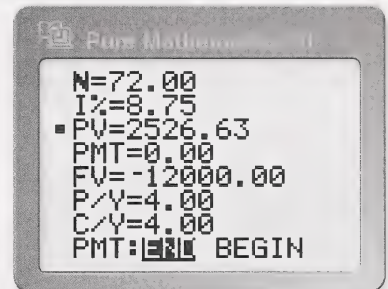
- a. Change the value of “FV” to $-12\,000.00$; then move the cursor to “I%” and press **ALPHA** **[SOLVE]**.

Elizabeth would have to invest at a rate of 6.15% per annum, compounded quarterly.



- b. Change the value of “I%” to 8.75%; then move the cursor to PV and press **ALPHA** **[SOLVE]**.

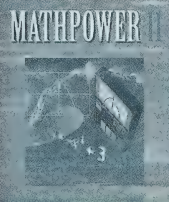
Elizabeth would have to invest \$2526.63.



Turn to “TECHNOLOGY” on page 544 of *MATHPOWER™ 11* and work through the example in Investigation 1, “No Payments Made.”

1. Answer the following using your graphing calculator:
 - a. questions 1 and 2 of Investigation 1, “No Payments Made” on page 544 of the textbook
 - b. questions 26 and 27 of “Practice” on page 543 of the textbook
 - c. question 30 and 36 of “Applications and Problem Solving” on page 543 of the textbook

Compare your responses with those in the Appendix, Section 1: Follow-up Activities, Enrichment.

**Mathematical Process**

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

The Financial features on your graphing calculator can also be used in calculations where payments are made on a regular basis, such as in an annuity. These calculations can be used to determine the value of an annuity after a certain number of years of payments to the recipient as well as the value of an annuity after a certain number of years of payments being made into the annuity.

Example

Wayne is receiving \$850 a month from an annuity of \$45 000 earning 6.75% per annum, compounded monthly.

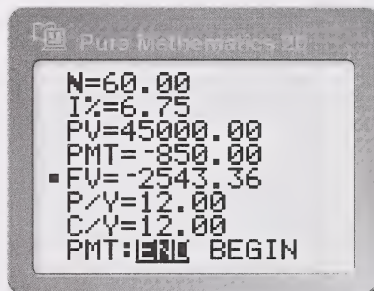
- What is the value of the annuity after 5 years of payments?
- How can you tell if the value of the annuity after 5 years of payments represents money still in the annuity or if it represents an amount that is overpaid?



Solution

- Number of payment periods = 12×5
 Annual interest rate = 6.75%
 Present value = 45 000
 Payment = -850
 Future value: to be determined
 Payments per year = 12
 Compounding periods per year = 12

The value of the annuity after 5 years is \$2543.36.

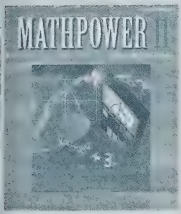


- Try different values for the number of years that the annuity is paid. For example, try 6 years. If the sign of the future value changes then you know that the negative value of the future value with 5 years of payments represents an amount of the annuity that is remaining.

The idea of equal payments over a given period of time can be applied to situations other than annuities. Calculations involving loans and payments on items purchased can also be performed using the Financial features on your graphing calculator.

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization



Turn to page 545 of *MATHPOWER™ 11* and examine question 1 of Investigation 2, “Monthly Payments Made.”

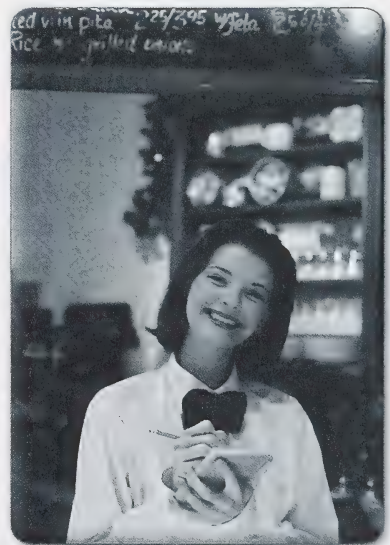
2. Answer questions 2, 3, and 5 of Investigation 2, “Monthly Payments Made” on page 545 of the textbook.
3. Answer questions 31 and 34 of “Applications and Problem Solving” on page 543 of the textbook.

Compare your responses with those in the Appendix, Section 1: Follow-up Activities, Enrichment.

Conclusion

In this section, you were introduced to consumer mathematics. You investigated ways of earning a living and several ways of saving money. You discovered that there are various ways of getting paid and analysed pay stubs to see what deductions are made. You then reconciled savings accounts and chequing accounts with bank statements. Finally, you solved many compound interest problems as you examined investments and loans.

This study of consumer mathematics should give you a greater understanding of what to expect in the job market and what is involved with living on your own. If you already have a part-time job, many of your experiences will serve you well in the future. You will have experienced, first-hand, many of the issues discussed in this section—from handling money and paying taxes to saving for tomorrow.



Assignment

You are now ready to complete the assignment for Section 1.



Section 2





Cost of Independence

Are you thinking of moving out on your own? Are you planning to rent your own apartment or purchase a car? Would you like to go on a holiday to some other part of the world? You know you can always borrow money in order to afford these things, whether it is a personal loan or a car loan.

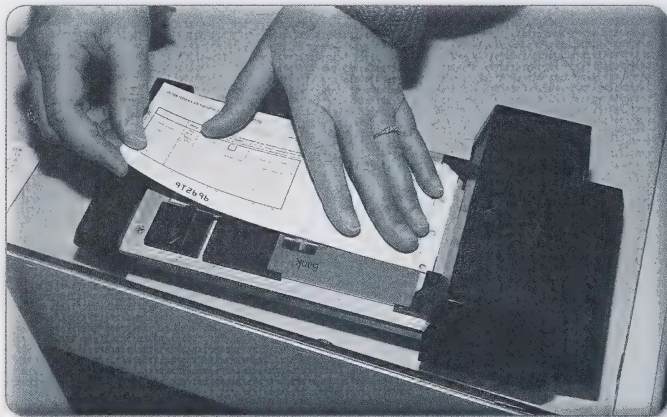
You may want to reconsider, rather than giving in to your impulses. You should be aware that the costs involved with consumer credit, accommodation, owning and operating a vehicle, and travel can be very high. When starting out on your own, you need to be cautious about how much you spend on necessities and luxuries and budget your money wisely.

In this section, you will investigate some of the costs involved with using credit cards, living on your own, owning a vehicle, and travelling to other parts of the world. You will also analyse a budget and develop budgeting skills. Lastly, you will compare prices of items and assess how to spend your money wisely.



Activity 1: Consumer Credit

Do you have a credit card? Many young people, today, have their own credit cards. A student credit card is used in the same way as any other credit card except the credit limit is low, some as low as \$500. Anytime you use a credit card to buy an item, you are using **consumer credit**.



consumer credit: the ability to purchase an item with an agreement to pay for it at a later date

Although overuse of credit cards can lead to excessive debt, wise use of a credit card will help develop a good credit rating as well as give you the freedom to make purchases when a desired item may be at a reduced price. However, the use of consumer credit and credit cards generally requires the payment of interest charges.

Turn to page 551 of *MATHPOWER™ 11* and read “Consumer Credit.”

1. Answer the following questions on page 551 of the textbook:

- a. questions a. and b. of “Explore: Interpret the Information”
- b. questions 1 and 2 of “Inquire”

Compare your responses with those in the Appendix, Section 2: Activity 1.



Most instalment purchase plans require a down payment and have finance charges added to the balance. The finance charges are based on the outstanding balance only, and the monthly payment is determined by dividing the sum of the outstanding balance and the finance charges by the number of monthly payments.

MATHPOWER



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization

Turn to pages 551 and 552 of *MATHPOWER™ 11* and work through Example 1.

2. Answer the following questions on pages 555 and 556 of the textbook:

- a. questions 1 and 2 of “Practice”
- b. questions 26 and 27 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 2: Activity 1.

Have you noticed that many retail businesses are now issuing credit cards? Credit cards have become a very popular form of consumer credit. Originally, credit cards were issued only by the major banks (eg., VISA and MasterCard). Over the years, however, oil companies (eg., Esso), department stores (eg., The Bay), auto-part retailer chains (eg., Canadian Tire), and so on have issued their own credit cards.



Most credit cards have a limit on the amount that can be charged and require a minimum payment to be made before or on a **due date**. A cardholder may pay more than the minimum amount or the entire amount. Interest is charged on any amount remaining after the due date. Interest may also be charged on new purchases when there is a previous balance.

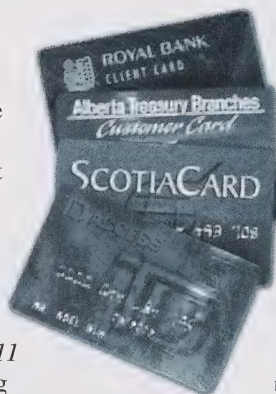
For additional information on credit cards and retail charge accounts, turn to page 552 of *MATHPOWER™ 11* and read from the red line to the red line on page 553, working through Example 2.

3. Is there a credit charge on new purchases?
4. Explain how the credit charge is calculated?
5. Answer the following questions on pages 555 and 556 of the textbook:
 - a. questions 3, 5, 7, 21, and 23 of “Practice”
 - b. questions 28 and 30 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 2: Activity 1.

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Another type of credit card, which can be used to purchase goods and services or obtain cash advances, is a bank card. Most major banks offer bank cards to those with approved credit. Cardholders receive a monthly statement indicating the various transactions that the card has been used for over the month. Payment is due about 21 to 25 days after the statement date. No interest is charged if the payment is for the full amount of the statement. If the full amount of the statement is not paid, interest charges appear on the next statement.



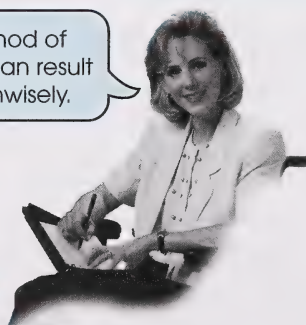
For more information on bank credit cards and how the interest is determined, turn to page 553 of *MATHPOWER™ 11* and read from the red line to the red line on page 555, working through Example 3.

6. Is the interest charge determined in the same way on bank-card transactions as it is on retail accounts? Explain.
7. Compare the interest rates used in Example 2 and Example 3 by changing each interest rate to a rate per annum.
8. Answer the following questions on pages 555 and 556 of the textbook:
 - a. questions 11, 13, 17, and 19 of “Practice”
 - b. question 29 of “Applications and Problem Solving”

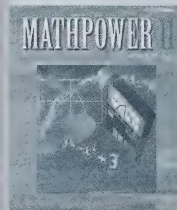
Compare your responses with those in the Appendix, Section 2: Activity 1.

Credit cards can be a very useful method of purchasing goods and services, or they can result in unnecessary debt if they are used unwisely.

9. Turn to page 556 of *MATHPOWER™ 11* and answer questions 31 and 32 of “Applications and Problem Solving.”

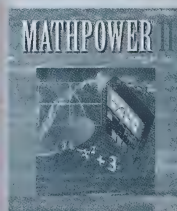


Compare your responses with those in the Appendix, Section 2: Activity 1.



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization



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Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization



foreign exchange: the value of one country's currency in terms of another country's currency

Foreign Currencies

Bank credit cards are often very useful in foreign countries because the credit rating of the cardholder can be easily checked. Buying goods or services in a foreign country involves **foreign exchange**. The cost of goods and services purchased has to be adjusted to reflect the value of the currency of the country from which they are purchased. When a bank card is used, the adjustment for the foreign exchange rate is included in the statement you receive.

Turn to “INVESTIGATING MATH” on page 526 of *MATHPOWER™ 11* and examine the table showing the foreign exchange rate of a number of different currencies in terms of Canadian dollars.

You can use this table to convert a certain foreign currency to Canadian funds and vice versa. To convert foreign currency to Canadian funds, multiply by the number of Canadian dollars per unit. To convert Canadian funds to a certain foreign currency, divide by the number of Canadian dollars per unit.

Example

Use the foreign exchange rate table to convert the following into Canadian funds. Round your answers down to the nearest cent.

- a. \$1000 US
- b. 550 kronor

Solution

a. $1000 \times 1.5257 = 1525.7$

Therefore, \$1000 US converts to \$1525.70 Canadian.

b. $550 \times 0.1923 = 105.765$

Therefore, 550 kronor converts to \$105.76 Canadian.



Note: Kronor is the plural form of krona.



Example

Use the foreign exchange rate table to convert the following Canadian funds into the foreign currency indicated. Round your answers to the nearest whole currency value.

- a. \$100 Canadian to pounds sterling
- b. \$300 Canadian to drachmas

Solution

$$\text{a. } \frac{100}{2.5517} = 39.2$$

Therefore, \$100 Canadian converts to 39 pounds sterling.

$$\text{b. } \frac{300}{0.0051} = 58\,823.5$$

Therefore, \$300 Canadian converts to 58 824 drachmas.

10. Turn to “INVESTIGATING MATH” on page 526 of *MATHPOWER™ 11* and answer the following:

- a. questions 1 to 5 and 7 of Investigation 1, “Converting Currencies”
- b. question 3 of Investigation 2, “Buying and Selling”

Compare your responses with those in the Appendix, Section 2: Activity 1.



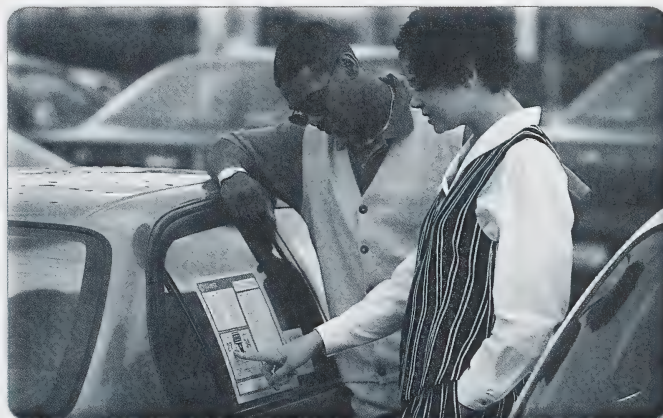
Use the Internet to research current foreign currencies and to compare various currencies with the Canadian dollar. Enter the words “foreign currency” or “foreign exchange” in one of the Internet’s search engines. One website you can visit is as follows:

<http://www.x-rates.com>

Now Try This

Have you thought about owning your own car? Most young people would like to own a vehicle, although owning a car, whether new or used, involves more than just buying it.

What are the costs associated with owning and operating a motor vehicle?



11. Candace has been shopping around for a car. She is comparing three options: buying a used car, leasing a new car, and buying a new car.

If Candace chooses to buy a used car for \$11 000, she can pay \$2000 down and finance the remainder at \$270 per month for 36 months. If Candace chooses to lease a new car, she can lease it with \$1000 down and \$219 per month with a refundable security deposit of \$300. If Candace chooses to buy a new car, she can pay \$2500 down and get a loan of \$15 000 at 2.9% per annum over 48 months, resulting in monthly payments of \$331.35.

What are some of the things that Candace should consider for each option before she decides which one to choose? Which option would you choose?

Compare your response with the one in the Appendix, Section 2: Activity 1.

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization

Most people today have to finance the purchase of a car or truck. Financing a vehicle usually means having to make a down payment and then pay the remainder through monthly instalments. The financing can be done through the dealership selling the vehicle or through a bank.



12. Turn to “CONNECTING MATH AND TRANSPORTATION” on page 570 of *MATHPOWER*™ 11 and answer questions 1 and 3 of Investigation 2, “Financing a Car Purchase.”

Compare your responses with those in the Appendix, Section 2: Activity 1.

Looking Back

In this activity, you analysed two types of credit cards and discovered some of the costs involved when using credit. You discovered how interest is calculated on retail charge accounts and on bank credit-card accounts.

Interest rates vary between bank credit cards and retail charge accounts. Use the Internet or talk to someone at your local bank or department store and determine the maximum rate that can be charged on retail charge accounts and on bank credit cards. Write your findings in your journal.



MATHPOWER



Mathematical Process

- ☒ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

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Activity 2: Cost of Buying a House

Buying a house is the largest single-item purchase most people will make in their lifetime. For most people, buying a house means taking out a **mortgage** and making monthly payments on the mortgage for 20 years, 25 years, or even 30 years. Mortgage tables are used to determine the monthly payments required for a given mortgage.



Turn to page 557 of *MATHPOWER™ 11* and read “Housing Costs.”

1. Match each term with its definition.

Terms	Definition
_____ mortgage	i. to repay a mortgage over a given period of time in equal, periodic payments
_____ mortgagor	ii. a person borrowing the money for a mortgage
_____ mortgagee	iii. a person lending the money for a mortgage
_____ amortize	iv. the length of time that a mortgage agreement is in effect
_____ amortization period	v. period of time over which a mortgage is paid
_____ term of a mortgage	vi. agreement between a money lender and a borrower involving the purchase of property

2. Answer the following questions on page 557 of the textbook:

- questions a. and b. of “Explore: Use a Table”
- questions 1 to 4 of “Inquire”

Compare your responses with those in the Appendix, Section 2: Activity 2.



Every mortgage requires a down payment. The larger the down payment, the smaller the mortgage. Also, a lending institution will be more willing to lend the money if you have a large down payment. A conventional mortgage requires a minimum down payment of 25% of the property value.

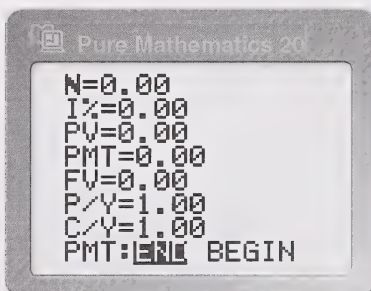
To calculate the monthly payment on a mortgage, you can use an amortization table (such as the one illustrated on page 590 of *MATHPOWER™ 11*) or the Financial features on your graphing calculator.

Turn to page 558 of *MATHPOWER™ 11* and work through Example 1. This example illustrates how to determine the down payment and how to calculate the monthly payments.

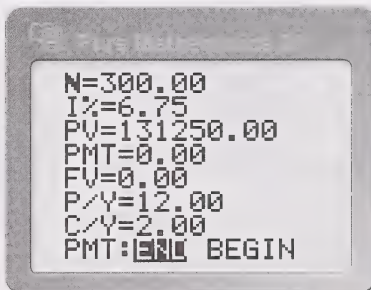
Using the information from Example 1 in the textbook, the following steps review how to use the Financial features on your graphing calculator. **Note:** Make sure you change the mode on your graphing calculator to 2 decimal places.

Step 1: Open the financial calculations.

2nd [FINANCE] 1 (1: TVM Solver...)



Step 2: Enter the values, pressing **ENTER** after each value.



MATHPOWER



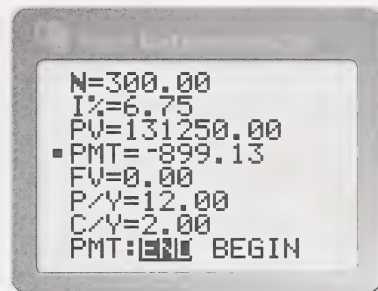
Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Step 3: Move the cursor to payment,

"PMT = 0.00," and press **ALPHA**

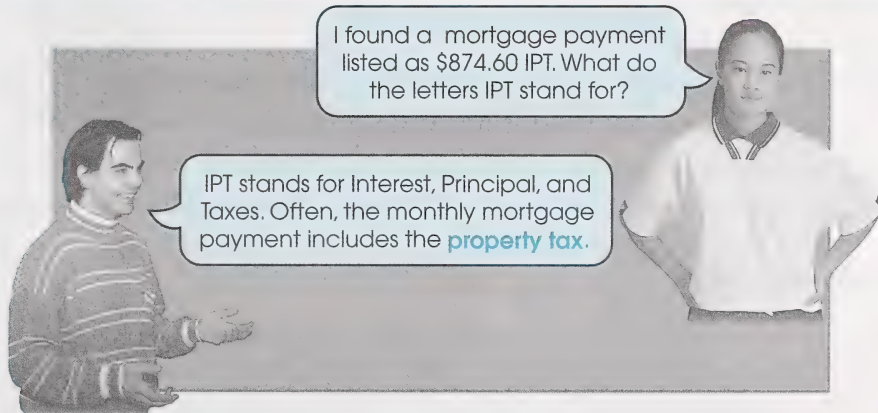
[SOLVE].



Notice that the payment is shown as a negative value. This is because the payment is an amount paid out.

3. Turn to page 560 of *MATHPOWER*™ 11 and answer the following:
 - a. questions 1, 3, 9, and 11 of "Practice"
 - b. questions 26 and 27 of "Applications and Problem Solving"

Compare your responses with those in the Appendix, Section 2: Activity 2.



I found a mortgage payment listed as \$874.60 IPT. What do the letters IPT stand for?

IPT stands for Interest, Principal, and Taxes. Often, the monthly mortgage payment includes the **property tax**.

property tax: money collected by the municipality to pay for services, such as water, road construction and maintenance, and garbage disposal

Property taxes are based on the assessed value of the property and are calculated using a **mill rate**. For more information on calculating property taxes, turn to page 558 of *MATHPOWER™ 11* and read from the red line to the bottom of page 559, working through Examples 2 and 3.

4. Answer the following questions on pages 560 and 561 of the textbook:

- a. questions 14, 15, 18, 20, and 22 of “Practice”
- b. questions 30, 32, and 33 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 2: Activity 2.

Now Try This

Often, it is a big decision whether to rent an apartment or buy a house. Use a newspaper or the Internet to compare the cost of renting an apartment to renting a house and to buying a house.

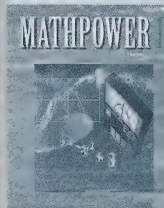
5. List the additional costs that must be included in the costs of each option.
6. Turn to page 561 of *MATHPOWER™ 11* and answer question 39 of “Applications and Problem Solving.”

Compare your responses with those in the Appendix, Section 2: Activity 2.

Looking Back

In this activity, you determined the monthly mortgage payment when buying a house, using an amortization table, and using a graphing calculator. You also discovered how property taxes are calculated.

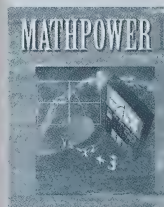
Buying a home involves considering the different types of mortgages you can obtain. Use your research skills to answer question 37 of “Applications and Problem Solving” on page 561 of the textbook. Enter your findings in your journal.



mill rate: a rate at which property tax is calculated

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization



Mathematical Process

- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Activity 3: Making a Budget

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Provincial government announces budget

TONIGHT, at 7:00 p.m., the government will announce their budget for the new fiscal year. It is expected that, for the first time in years, the budget will be a balanced one. At the time of



These days, politicians often compare preparing a budget for a government to preparing a budget for a household. They argue that income and expenses should balance, just like the income and expenses of the average person. They also argue that if money must be borrowed, then there should be provisions within the budget to repay the loan in a timely fashion, again, just like the average person.

What is a budget? What is a balanced budget? Turn to page 562 of *MATHPOWER*™ 11 and read “Balancing a Budget.”

1. Define *budget* and *balanced budget*.
2. Answer the following questions on page 562 of the textbook:
 - a. questions a. and b. of “Explore: Interpret the Graph”
 - b. questions 1 to 5 of “Inquire”

Note: You may need to research the answers to questions 2 to 4 in a library, on the Internet, or through discussion with friends or family members.

Compare your responses with those in the Appendix, Section 2: Activity 3.

To complete a personal budget, you need to determine what type of expenses you have—fixed, variable, and occasional.



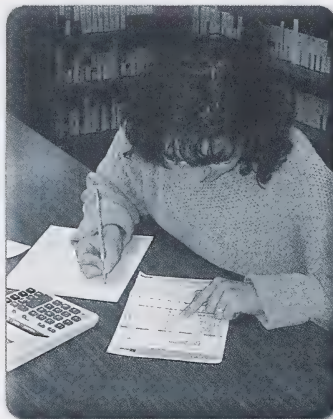
Turn to page 562 of *MATHPOWER*™ 11 and read from the red line to the red line on page 563, working through Example 1.

3. Answer the following questions on page 565 of the textbook. **Note:** You may wish to use a spreadsheet to complete the questions that require the construction of a budget. Once you have one budget plan completed, you can revise it to answer other questions rather than starting a new plan.
 - a. questions 1, 3, 4, 6, 8, 14, 15, 16, and 20 of “Practice”
 - b. question 22 of “Applications and Problem Solving”

Compare your responses with those in the Appendix, Section 2: Activity 3.

Rana keeps a monthly budget of all her income and expenses. Rana was given three months’ notice that her rent would increase by \$50 per month. In addition, she finds that her utilities and cable TV have gone up \$18 per month. However, her car insurance has decreased by \$22 per month because she has driven accident-free for the past three years. Rana also received a \$200-per-month increase in her salary. Accommodating all these changes requires Rana to alter her budget in order to keep it balanced.

Altering a budget and maintaining the balance may require adjusting a number of items to accommodate a new expense, like a car purchase. Turn to pages 563 and 564 of *MATHPOWER*™ 11 and work through Example 2.



4. What expense item appears to be missing from Daniel’s Monthly Budget Statement that includes the car purchase? What type of expense is this? Where might Daniel get the extra money to pay for this additional expense.
5. Answer questions 21, 23, 25, and 26 of “Applications and Problem Solving” on pages 565 and 566 of the textbook.

Compare your responses with those in the Appendix, Section 2: Activity 3.

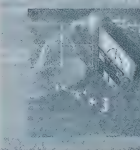
MATHPOWER



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

MATHPOWER



Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization

Mathematical Process

- ☐ Communication
- ☒ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Now Try This

Budgets are useful in planning any expenditures. Businesses, governments, and individuals use budgets to control their expenditures and show where the money is spent. At some time, you may be required to prepare a budget for a club to which you belong, for a place of business, or for someone you know.



You can transfer the skills you have developed in preparing a budget for yourself to that of preparing a budget for others.

6. Turn to page 566 of *MATHPOWER™ 11* and answer question 29 of “Applications and Problem Solving.”

Compare your response with the one in the Appendix, Section 2: Activity 3.

Looking Back

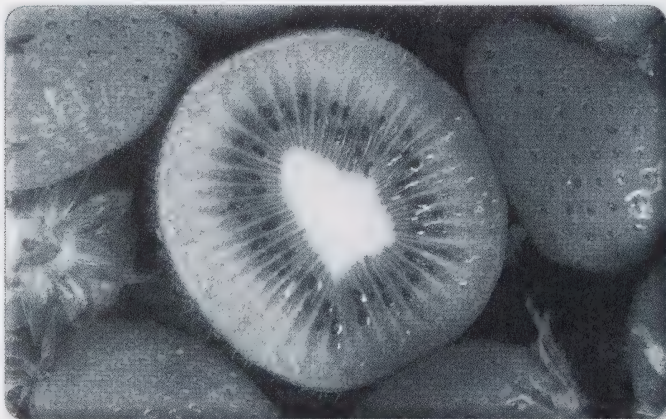
In this activity, you defined the terms *budget* and *balanced budget*, analysed a number of budgets, and identified the key elements of a budget. You then created a number of budgets for individuals with regard to individual preferences; and you revised some budgets, determining which expenditures can be adjusted and which cannot.

Make a list of items that are fixed expenses and items that are variable expenses. Which variable expenses would you adjust the most? Which ones would you adjust the least? Compare your answers with those of a friend. What conclusions can you draw? Write your answers and your conclusions in your journal.

**Mathematical Process**

- ☒ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☐ Technology
- ☐ Visualization

Activity 4: Comparison Shopping



Jai wants to buy a stereo. He analysed his budget and found that food was one area where he spent a large amount of money. He has been shopping at a local food mart and wants to compare prices there to the prices at a couple of supermarkets. Kiwi is his favourite fruit. He found that the price of kiwi is 6 for \$1.99 at one supermarket, 10 for \$2.99 at another supermarket, and \$0.40 each at the food mart where he shops. In order to determine whether some money can be saved by shopping at a supermarket, Jai has to compare **unit prices**.

In this activity, you will discover how to comparison shop using unit prices.

You may wish to use a spreadsheet to answer questions involving unit prices. Enter the given information and add a column for unit prices. Use the formula bar to calculate the unit prices.



1. Turn to “GETTING STARTED” on page 524 of *MATHPOWER™ 11* and answer questions 1 to 4 of Investigation 1, “Comparing Unit Prices.”

Compare your responses with those in the Appendix, Section 2: Activity 4.

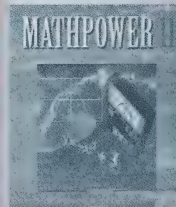
Mathematical Process

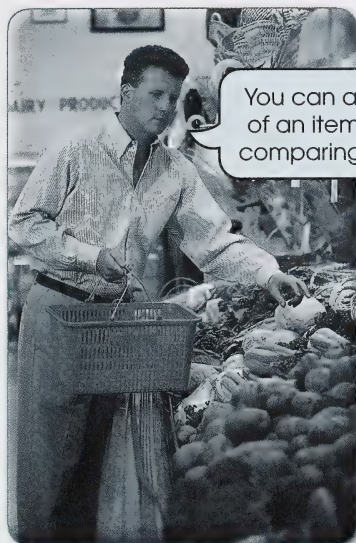
- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☒ Reasoning
- ☐ Technology
- ☐ Visualization

unit price: the price of a single item; the price of one unit of an item

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization





2. Turn to “GETTING STARTED” on page 524 of *MATHPOWER*™ 11 and answer questions 1 to 4 of Investigation 2, “Buying at a Supermarket.”

Compare your responses with those in the Appendix, Section 2: Activity 4.

Now Try This

3. “Comparison shopping and budgeting go hand in hand.”

Discuss the preceding statement in terms of what you have discovered concerning comparison shopping and unit prices as well as what you have discovered concerning budgeting.

Compare your responses with those in the Appendix, Section 2: Activity 4.

Looking Back

In this activity, you analysed the prices of various items of different sizes as well as prices of several items at different stores. You calculated the unit price for each item and compared the unit prices with various stores. You then identified the items with the lowest price, and you listed factors, other than lowest price, that you may consider when comparison shopping.

Visit a number of stores in the area where you live and compare the prices of several items in each store. Make a list of factors, other than price, that you consider important when shopping at each store. Write your findings in your journal.

MATHPOWER

Mathematical Process

- ☒ Communication
- ☒ Connection
- ☒ Estimation
- ☒ Mental Math
- ☒ Problem Solving
- ☒ Reasoning
- ☒ Technology
- ☒ Visualization

Mathematical Process

- ☒ Communication
- ☒ Connection
- ☒ Estimation
- ☒ Mental Math
- ☒ Problem Solving
- ☒ Reasoning
- ☒ Technology
- ☒ Visualization

Follow-up Activities

If you had difficulties understanding the concepts and skills in the activities, it is recommended that you do the Extra Help. If you have a clear understanding of the concepts and skills, it is recommended that you do the Enrichment. You may decide to do both.

Extra Help

In this section, you analysed a number of topics involving money. Often, questions involving money use a table. Some questions in each of these topics could have been completed using a spreadsheet.

Example

Complete the following department-store account using a spreadsheet. Use an interest rate of 1.5% per month.

	A	B	C	D	E	F	G
1	Month	Previous Balance (+)	Payment (-)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.5%)	New Balance (=)
2	September	\$231.97	\$100.00	\$145.98			
3	October		\$100.00	\$196.45			
4	November		\$100.00	\$256.89			
5	December		\$250.00	\$44.25			

Solution

Step 1: Complete the Balance Due, Credit Charge, and New Balance columns for the month of September.

- In cell E2, enter “=B2-C2+D2”.
- In cell F2, enter “=E2*0.015”.
- In cell G2, enter “=E2+F2”.

Note: To get the \$ symbol for columns B to G, highlight these columns and click on the \$ button in the header bar.

Your spreadsheet should look like the following.

	A	B	C	D	E	F	G
1	Month	Previous Balance (+)	Payment (-)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.5%)	New Balance (=)
2	September	\$231.97	\$100.00	\$145.98	\$277.95	\$4.17	\$282.12
3	October		\$100.00	\$196.45			
4	November		\$100.00	\$256.89			
5	December		\$250.00	\$44.25			

Mathematical Process

- ☐ Communication
- ☐ Connection
- ☐ Estimation
- ☐ Mental Math
- ☐ Problem Solving
- ☐ Reasoning
- ☒ Technology
- ☐ Visualization

Step 2: Enter the formulas to calculate the previous balances for October, November, and December.

- In cell B3, enter “=G2” because the previous balance is equal to the new balance from the previous month.
- Select cells B3 to B5; then, from the Calculate menu, select “Fill Down.”

Your spreadsheet should look like the following.

	A	B	C	D	E	F	G
1	Month	Previous Balance (+)	Payment (-)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.5%)	New Balance (=)
2	September	\$231.97	\$100.00	\$145.98	\$277.95	\$4.17	\$282.12
3	October	\$282.12	\$100.00	\$196.45			
4	November	\$0.00	\$100.00	\$256.89			
5	December	\$0.00	\$250.00	\$44.25			

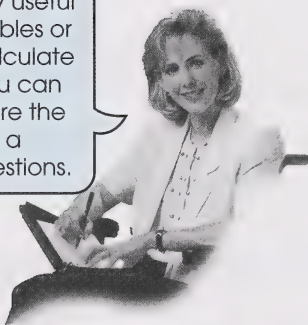
Step 3: Complete the spreadsheet. Select cells E2 to G5; then from the Calculate menu, select “Fill Down.”

Your completed spreadsheet should look like the following.

	A	B	C	D	E	F	G
1	Month	Previous Balance (+)	Payment (-)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.5%)	New Balance (=)
2	September	\$231.97	\$100.00	\$145.98	\$277.95	\$4.17	\$282.12
3	October	\$282.12	\$100.00	\$196.45	\$378.57	\$5.68	\$384.25
4	November	\$384.25	\$100.00	\$256.89	\$541.14	\$8.12	\$549.25
5	December	\$549.25	\$250.00	\$44.25	\$343.50	\$5.15	\$348.66



You should try and get as familiar as possible with spreadsheets. You will find them very useful in working with any problem involving tables or charts. You can use a spreadsheet to calculate property tax, given the mill rate, and you can set up and complete a budget, compare the cost of various items, and so on. Use a spreadsheet to answer the following questions.



1. The following table shows a department store credit-card account summary. Copy the given information and complete the table using a spreadsheet. Use an interest rate of 1.8% per month.

	A	B	C	D	E	F	G
	Month	Previous Balance (+)	Payment (–)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.8%)	New Balance (=)
1							
2	January	\$385.60	\$200.00	\$134.76			
3	February		\$200.00	\$231.25			
4	March		\$200.00	\$178.99			
5	April		\$200.00	\$84.50			
6	May		\$200.00	\$190.69			

2. a. Use a spreadsheet to set up a table and calculate the property tax for each of the following assessments if the mill rate is 36.75.
- \$127 900
 - \$239 000
 - \$98 500
 - \$113 700
- b. Explain how you could set up your table so that a change in mill rate will result in a change in the property tax amount for each assessment.
3. Use a spreadsheet to set up a budget of income and expenditures for you or for someone you know.

Compare your responses with those in the Appendix, Section 2: Follow-up Activities, Extra Help.

Mathematical Process

- Communication
- Connection
- Estimation
- Mental Math
- Problem Solving
- Reasoning
- Technology
- Visualization

Enrichment

In the activity on budgeting, you analysed how to change your budget in order to accommodate monthly payments for a new item you want to purchase. It will be easier to determine where you might be able to change your budget if you keep a record of the actual amount you spend for each category. The difference between the budgeted amount and the actual amount for each category is called variance.



Example

Anne prepared a budget three months ago. Since then, she has carefully monitored her spending so she could compare her budget with her spending. Find the variance for each item in Anne's budget.

Item	Budgeted Amount	Actual Amount
Rent and Utilities	\$500.00	\$476.00
Food	\$300.00	\$275.00
Clothing	\$200.00	\$235.00
Transportation	\$100.00	\$75.00
Savings	\$100.00	\$80.00

Solution

Item	Budgeted Amount	Actual Amount	Variance
Rent and Utilities	\$500.00	\$476.00	+\$24.00
Food	\$300.00	\$275.00	+\$25.00
Clothing	\$200.00	\$235.00	-\$35.00
Transportation	\$100.00	\$75.00	+\$25.00
Savings	\$100.00	\$80.00	+\$20.00

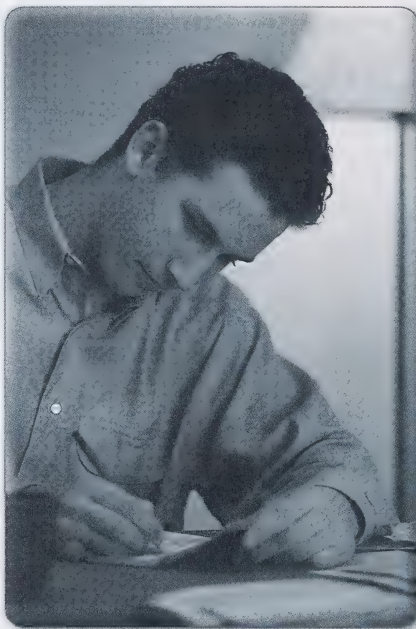
1. Turn to page 566 of *MATHPOWER*™ 11 and answer question 24 of “Applications and Problem Solving.”
2. Start a monthly budget for your income and expenditures. Keep a record of your actual expenses for a month and determine the variance for each category you have listed in your budget.

Compare your responses with those in the Appendix, Section 2: Follow-up Activities, Enrichment.

Conclusion

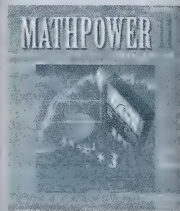
In this section, you explored the cost of independence. You examined consumer credit and loans; you explored the costs of accommodation, comparing rental properties with purchasing a home. You then used tables and the Financial features of your graphing calculator to determine mortgage costs. In addition, you examined taxes, foreign exchange rates, preparing budgets, and informed shopping. These are issues with which everyone must learn to cope.

Have you thought of living on your own? One of the costs of independence is having to handle money responsibly. You will quickly discover that juggling income and expenses is a lifelong challenge. The wise use of credit is part of the picture, and you must consider this option when budgeting your finances and planning for your future. Become aware about your choices and don't hesitate to seek informed advice.



Assignment

You are now ready to complete the assignment for Section 2.



Module Summary

In this module, you explored issues in financial mathematics. In Section 1, you focussed on earning an income and banking. You examined wages and salaries earned in a variety of employment situations. You then distinguished between gross income and net income, and you investigated opportunities for investing your income and banking options. Lastly, you explored savings and chequing accounts, financial statements, and earning interest on your deposits.

In Section 2, you examined the cost of independence. You explored the costs involved with living on your own, issues of consumer credit, comparison shopping, taxes, travel and exchange rates, and budgeting skills.

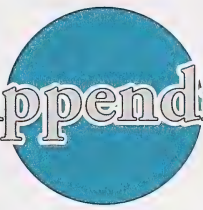


Managing your money involves a careful balance between income and expenses. When you succeed at this task, you feel the pride of accomplishment and the satisfaction of being able to reward yourself for your efforts. What do you plan to do with the money you save? Purchase a vehicle? How will you decide what you can afford today and what you must postpone until tomorrow?

Final Module Assignment

You are now ready to complete the final module assignment.





Appendix

Glossary
Suggested Answers
Spreadsheets

Glossary

annuity: a sequence of equal payments made at equal intervals of time

basic deductions: deductions set by the federal government that include Canada Pension Plan (CPP), Employment Insurance (EI), and income tax

biweekly: every two weeks

chequing account: a bank account that allows you to access funds within the account by writing cheques

compounded quarterly: interest calculated every three months and added to the principal for the next interest period

compounding period: length of time over which interest on an investment is calculated

compound interest: interest calculated at regular intervals and added to the principal for the next interest period

consumer credit: the ability to purchase an item with an agreement to pay for it at a later date

due date: the date a payment is to be made by

effective rate of interest: the simple interest rate that produces the same amount of interest as the compound interest rate

foreign exchange: the value of one country's currency in terms of another country's currency

gross annual income: total income earned in a year

gross income: the amount of money earned through employment before deductions

mill rate: a rate at which property tax is calculated

mortgage: an agreement between a money lender and a borrower involving the purchase of property

net income: the amount an employee receives after all deductions are subtracted from the employee's gross income

property tax: money collected by the municipality to pay for services, such as water, road construction and maintenance, and garbage disposal

reconcile: to verify the transactions in a personal transaction record book with a bank statement

savings account: a bank account that earns interest on the balance of the account

Funds in a savings account can only be withdrawn using your bank card or directly from a teller.

taxable income: income remaining after all approved deductions are made

unit price: the price of a single item; the price of one unit of an item

Suggested Answers

Section 1: Activity 1

1. Answers may vary. Sample answers are given.

- a. Employers pay their employees time-and-a-half or double time for overtime as an incentive to work longer hours. The employees' union has often negotiated this incentive.
- b. Because the kitchen staff is part of the team providing food and service in the restaurant, some servers give part of their tips to the kitchen staff.
- c. Most salespeople are paid commissions because commissions provide incentive to sell more product.
- d. One of the advantages of paying employees by piecework is that employees are encouraged to produce more pieces. The disadvantage is that the quality of the work may decrease as the speed increases.

2. First, subtract the number of hours at regular pay from the total number of hours worked that week. This gives you the number of overtime hours worked. Second, calculate the overtime rate by multiplying the regular hourly rate by 1.5. Finally, multiply the number of hours of overtime by the overtime rate.

3. Textbook questions 1, 3, and 5 of "Practice," p. 530

$$\begin{aligned}
 1. \quad \text{Regular hours} &= \text{overtime hours} \times 1.5 \\
 &= 10 \times 1.5 \\
 &= 15 \text{ h}
 \end{aligned}$$

$$\begin{aligned}
 3. \quad \text{Regular hours} &= \text{overtime hours} \times 1.5 \\
 &= 15 \times 1.5 \\
 &= 22.5 \text{ h}
 \end{aligned}$$

$$\begin{aligned}
 5. \quad \text{Regular hours} &= \text{overtime hours} \times 1.5 \\
 &= 3.5 \times 1.5 \\
 &= 5.25 \text{ h}
 \end{aligned}$$

4. Textbook questions 7 and 8 of "Practice," p. 530

$$\begin{aligned}
 7. \quad \text{a.} \quad \text{Monthly income} &= 43\,680 \div 12 \\
 &= 3640
 \end{aligned}$$

Rieko's gross monthly income is \$3640.

$$\begin{aligned}
 \text{b.} \quad \text{Weekly income} &= 43\,680 \div 52 \\
 &= 840
 \end{aligned}$$

Rieko's gross weekly income is \$840.

$$\begin{aligned}
 \text{c.} \quad \text{Hourly rate of pay} &= 840 \div 35 \\
 &= 24
 \end{aligned}$$

Rieko's hourly rate of pay is \$24.

Section 1: Activity 1 (continued)

8. Gross income at regular pay = number of hours $\times$ rate per hour

$$= 40 \times 9$$

$$= 360$$

Gross income at overtime pay = number of hours $\times$ rate per hour

$$= (50 - 40) \times (9 \times 1.5)$$

$$= 10 \times 13.50$$

$$= 135$$

Total gross income = $360 + 135$

$$= 495$$

Raymond's total gross income for the week is \$495.

5. a. Textbook questions 9, 10, and 11 of "Practice," p. 530

9. Gross weekly income = pay for regular hours + tips

$$= (40 \times 9) + 200$$

$$= 360 + 200$$

$$= 560$$

Gabriella's gross weekly income is \$560.

10. Gross weekly income = pay for regular hours + tips

$$= [(6 \times 5) \times 8.80] + (6 \times 20)$$

$$= (30 \times 8.80) + 120$$

$$= 264 + 120$$

$$= 384$$

Chas's gross weekly income is \$384.

11. Gross weekly income = pay for regular hours + tips

$$= [(7.5 \times 5) \times 9.90] + (5 \times 30)$$

$$= (37.5 \times 9.90) + 150$$

$$= 371.25 + 150$$

$$= 521.25$$

Li's gross weekly income is \$521.25.

b. Textbook question 21 of “Applications and Problem Solving,” p. 531

$$\begin{aligned}
 \text{21. Gross weekly income} &= \text{pay for regular hours} + \text{tips} \\
 &= (35 \times 8.25) + (1569 \times 0.15) \\
 &= 288.75 + 235.35 \\
 &= 524.10
 \end{aligned}$$

Bonnie's gross income for that week was \$524.10.

6. a. Textbook questions 12, 13, 14, and 19 of “Practice,” p. 530

$$\begin{aligned}
 \text{12. Gross monthly earnings} &= \text{total monthly sales} \times \text{rate of commission} \\
 &= 4789 \times 0.17 \\
 &= 814.13
 \end{aligned}$$

The gross monthly earnings are \$814.13.

$$\begin{aligned}
 \text{13. Gross monthly earnings} &= \text{total monthly sales} \times \text{rate of commission} \\
 &= 222\,800 \times 0.025 \\
 &= 5570
 \end{aligned}$$

The gross monthly earnings are \$5570.

$$\begin{aligned}
 \text{14. Gross monthly earnings} &= \text{total monthly sales} \times \text{rate of commission} \\
 &= 5765 \times 0.34 \\
 &= 1960.10
 \end{aligned}$$

The gross monthly earnings are \$1960.10.

$$\begin{aligned}
 \text{19. Gross monthly earnings} &= \text{salary} + \text{commission} \\
 &= (35 \times 14.85) + (4800 \times 0.15) \\
 &= 519.75 + 720 \\
 &= 1239.75
 \end{aligned}$$

Nirmala's gross earnings for the week are \$1239.75.

Section 1: Activity 1 (continued)

b. Textbook questions 23 and 24 of “Applications and Problem Solving,” p. 531

$$\begin{aligned}
 \text{23. Gross weekly income} &= \text{salary} + \text{commission} \\
 &= 500 + [(7200 - 5000) \times 0.04] \\
 &= 500 + (2200 \times 0.04) \\
 &= 500 + 88 \\
 &= 588
 \end{aligned}$$

Elmo's gross income for the week is \$588.

$$\begin{aligned}
 \text{24. Commission} &= (3000 \times 0.12) + (2000 \times 0.15) + [(15\,850 - 5000) \times 0.19] \\
 &= 360 + 300 + (10\,850 \times 0.19) \\
 &= 360 + 300 + 2061.50 \\
 &= 2721.50
 \end{aligned}$$

$$\begin{aligned}
 \text{Bonus} &= 15\,850 \times 0.02 \\
 &= 317
 \end{aligned}$$

$$\begin{aligned}
 \text{Gross monthly income} &= \text{commission} + \text{bonus} \\
 &= 2721.50 + 317 \\
 &= 3038.50
 \end{aligned}$$

Nadia's gross monthly income was \$3038.50.

7. a. Textbook question 18 of “Practice,” p. 530

$$\begin{aligned}
 \text{18. Gross yearly income} &= \text{gross weekly income} \times \text{number of weeks} \\
 &= (26 \times 15) \times 40 \\
 &= 390 \times 40 \\
 &= 15\,600
 \end{aligned}$$

April's gross yearly income is \$15 600.

b. Textbook questions 22, 25, and 27 of “Applications and Problem Solving,” p. 531

$$\begin{aligned}
 22. \text{ Gross weekly income} &= 250 + [(73 - 50) \times 7.50] \\
 &= 250 + (23 \times 7.50) \\
 &= 250 + 172.50 \\
 &= 422.50
 \end{aligned}$$

Louis's gross weekly earnings was \$422.50.

25. a. Myrna's method of earning income is piecework. She gets paid for each pizza she delivers.

$$\begin{aligned}
 \text{b. Gross weekly income} &= 235 \times 2 \\
 &= 470
 \end{aligned}$$

Myrna's gross income for the week is \$470.

c. Answers may vary. A pizza-delivery person could receive tips for an income.

$$\begin{aligned}
 27. \text{ a. Gross weekly income for Option A} &= \text{amount per page} \times \text{number of pages} \\
 &= 2.15 \times 120 \\
 &= 258
 \end{aligned}$$

Gross weekly income for Option B is 345.

$$\begin{aligned}
 \text{Difference} &= 345 - 258 \\
 &= 87
 \end{aligned}$$

On average, Option B pays \$87 more per week.

b. Option A

Advantage: There is potential for more income if the amount of work increases.

Disadvantage: If there is no work, there is no pay.

Option B

Advantage: Income is constant, thus allowing you to plan for a set amount of money.

Disadvantage: There is no incentive to maximize output.

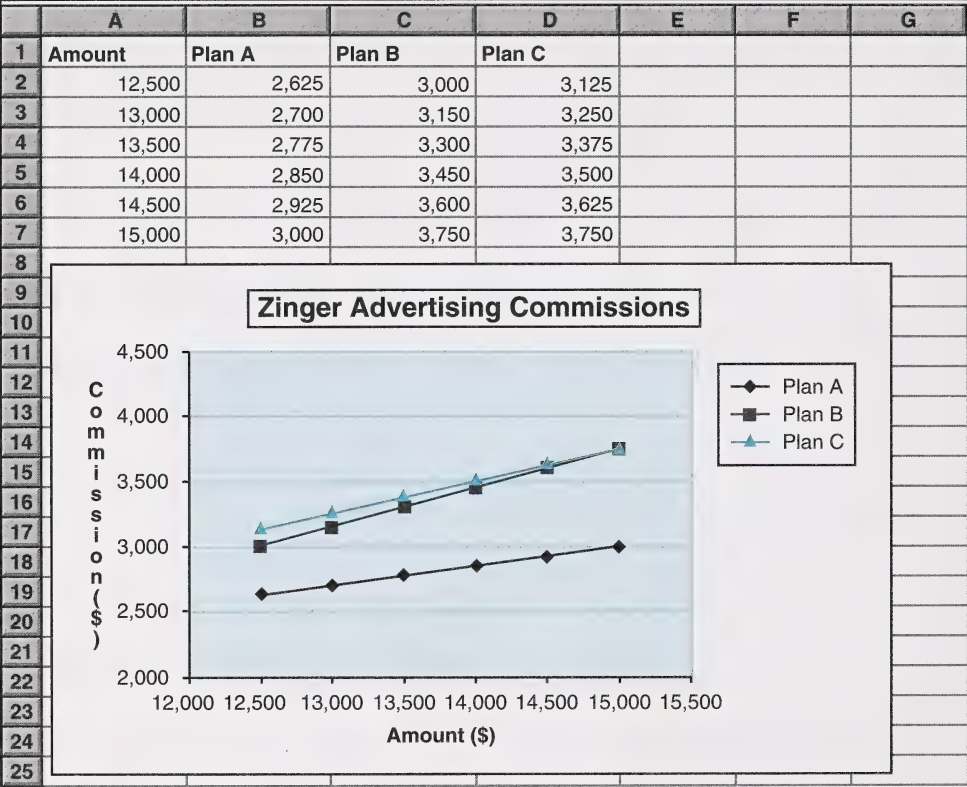
Section 1: Activity 1 (continued)

8. Textbook question 29 of “Applications and Problem Solving,” p. 531

29. a.

	A	B	C	D
1	Amount	Plan A	Plan B	Plan C
2	12,500	2,625	3,000	3,125

b.



c. According to the graph, Plan B begins to pay the highest gross income when the total sales is greater than \$15 000.

Section 1: Activity 2

1. a. The basic deductions are Canada Pension Plan (CPP), Employment Insurance (EI), and income tax.

$$\begin{aligned}\text{Total basic deductions} &= 22.24 + 23.96 + 219.46 \\ &= 265.66\end{aligned}$$

The basic deductions total \$265.66.

$$\begin{aligned}\text{b. Percent} &= \frac{\text{total basic deductions}}{\text{gross income}} \times 100\% \\ &= \frac{265.66}{887.25} \times 100\% \\ &= 29.9\%\end{aligned}$$

The basic deductions are about 29.9% of Nelda's gross income.

2. An employer may want to separate personal deductions from basic deductions because personal deductions may be unique to each employee.
3. Other personal deductions may include life insurance, dental plans, medical plans, and so on.
4. Net pay is equal to gross pay less the total of all deductions.

$$\therefore \text{Net pay} = \text{gross pay} - \text{total deductions}$$

5. a. Textbook question a. of “Explore: Use a Table,” p. 532

- a. The province that has the highest tax is British Columbia. This province has the latest date in which a worker finishes paying taxes (Tax Freedom Day).

- b. Textbook questions 1 and 2 of “Inquire,” p. 532

1. Alberta

June 12 is Tax Freedom Day for Alberta. The number of days up to and including June 11 is $31 + 28 + 31 + 30 + 31 + 11 = 162$.

$$\begin{aligned}\therefore \text{Percent of gross income} &= \frac{162}{355} \times 100\% \\ &\doteq 44.4\%\end{aligned}$$

The percent of gross income that Tax Freedom Day represents in Alberta is approximately 44.4%.

Section 1: Activity 2 (continued)

British Columbia

June 30 is Tax Freedom Day for British Columbia. The number of days up to and including June 29 is $31 + 28 + 31 + 30 + 31 + 29 = 180$.

$$\begin{aligned}\therefore \text{Percent of gross income} &= \frac{180}{365} \times 100\% \\ &\doteq 49.3\end{aligned}$$

The percent of gross income that Tax Freedom Day represents in British Columbia is approximately 49.3%.

$$\begin{aligned}2. \text{ Percent of gross income} &= \frac{27\,017}{56\,322} \times 100\% \\ &\doteq 48.0\%\end{aligned}$$

$$\begin{aligned}\text{Number of days} &\doteq 365 \times 0.48 \\ &= 175 \text{ (rounded to the nearest day)}\end{aligned}$$

The number of days to the end of May is 151; so, an additional $175 - 151 = 24$ days in June are needed to pay the taxes.

Therefore, Tax Freedom Day for the average Canadian household was June 25 for the year shown.

6. Textbook question 3 of “Inquire,” p. 532

- Answers may vary depending on the year and your province of residence. A sample answer of a person living in Alberta in 1998 is given.

Tax Freedom Day in Alberta in 1998 was June 13.

In Alberta in 1998, the percentage of gross income spent on taxes was 44.5%. Therefore, an average person earning a gross income of \$40 000 spent $40\,000 \times 0.445 = \$17\,800$ on all types of taxation.

7. Textbook questions 1 to 5, 7, 9 to 13, and 16 of “Practice,” p. 536

- There are 52 pay periods.
- There are 12 pay periods.
- There are 26 pay periods.

4. There are 24 pay periods.

$$\begin{aligned} 5. \text{ Gross annual income} &= 1305 \times 24 \\ &= 31\,320 \end{aligned}$$

$$\begin{aligned} \text{Contributory earnings} &= \text{gross annual income} - \text{basic CPP exemption} \\ &= 31\,320 - 3500 \\ &= 27\,820 \end{aligned}$$

$$\begin{aligned} \text{Annual CPP contribution} &= 3.2\% \text{ of } 27\,820 \\ &= 0.032 \times 27\,820 \\ &= 890.24 \end{aligned}$$

$$\begin{aligned} \text{Semi-monthly CPP contribution} &= 890.24 \div 24 \\ &= 37.09 \end{aligned}$$

Corinne's semi-monthly CPP contribution is \$37.09.

$$\begin{aligned} 7. \text{ Gross annual salary} &= 2267 \times 12 \\ &= 27\,204 \end{aligned}$$

$$\begin{aligned} \text{Contributory earnings} &= \text{gross annual income} - \text{basic CPP exemption} \\ &= 27\,204 - 3500 \\ &= 23\,704 \end{aligned}$$

$$\begin{aligned} \text{Annual CPP contribution} &= 3.2\% \text{ of } 23\,704 \\ &= 0.032 \times 23\,704 \\ &= 758.53 \end{aligned}$$

$$\begin{aligned} \text{Monthly CPP contribution} &= 758.53 \div 12 \\ &= 63.21 \end{aligned}$$

Atholl's monthly CPP contribution is \$63.21.

$$\begin{aligned} 9. \text{ Gross annual income} &= (38 \times 11.25) \times 52 \\ &= 22\,230 \end{aligned}$$

$$\begin{aligned} \text{Contributory earnings} &= \text{gross annual income} - \text{basic CPP exemption} \\ &= 22\,230 - 3500 \\ &= 18\,730 \end{aligned}$$

Section 1: Activity 2 (continued)

$$\begin{aligned}\text{Annual CPP contribution} &= 3.2\% \text{ of } 18\,730 \\ &= 0.032 \times 18\,730 \\ &= 599.36\end{aligned}$$

$$\begin{aligned}\text{Weekly CPP contribution} &= 599.36 \div 52 \\ &= 11.53\end{aligned}$$

Paul's weekly CPP contribution is \$11.53.

- 10.** Contributory earnings = gross annual income – basic CPP exemption
- $$\begin{aligned}&= 34\,000 - 3500 \\ &= 30\,500\end{aligned}$$

$$\begin{aligned}\text{Annual CPP contribution} &= 3.2\% \text{ of } 30\,500 \\ &= 0.032 \times 30\,500 \\ &= 976\end{aligned}$$

$$\begin{aligned}\text{Semi-monthly contribution} &= 976 \div 24 \\ &= 40.67\end{aligned}$$

Mara's semi-monthly CPP contribution is \$40.67.

- 11.** Weekly EI premium = 2.7% of 408
- $$\begin{aligned}&= 0.027 \times 408 \\ &= 11.02\end{aligned}$$

Todd's Employment Insurance premium for the week is \$11.02.

- 12.** Annual EI premium = 2.7% of 28 650
- $$\begin{aligned}&= 0.027 \times 28\,650 \\ &= 773.55\end{aligned}$$

$$\begin{aligned}\text{Biweekly EI premium} &= 773.55 \div 26 \\ &= 29.75\end{aligned}$$

Shai's biweekly EI premium is \$29.75.

$$\begin{aligned}
 13. \text{ Monthly EI premium} &= 2.7\% \text{ of } 2175 \\
 &= 0.027 \times 2175 \\
 &= 58.73
 \end{aligned}$$

Barb's monthly EI premium is \$58.73.

$$\begin{aligned}
 16. \text{ Weekly income} &= 37.5 \times 18.70 \\
 &= 701.25
 \end{aligned}$$

$$\begin{aligned}
 \text{Biweekly income} &= 701.25 \times 2 \\
 &= 1402.5
 \end{aligned}$$

$$\begin{aligned}
 \text{Biweekly EI premium} &= 2.7\% \text{ of } 1402.50 \\
 &= 0.027 \times 1402.50 \\
 &= 37.87
 \end{aligned}$$

Daniel's biweekly EI premium is \$37.87.

8. Textbook questions 17, 19, 21, 22, 23, 25, and 27 of "Practice," p. 536

$$\begin{aligned}
 17. \text{ Federal tax} &= 17\% \text{ of } 26\,800 \\
 &= 0.17 \times 26\,800 \\
 &= 4556
 \end{aligned}$$

The amount of Steve's federal tax is \$4556.

$$\begin{aligned}
 19. \text{ Federal tax} &= 17\% \text{ of } 29\,590 + 26\% \text{ of } (32\,138 - 29\,590) \\
 &= 0.17 \times 29\,590 + 0.26 \times 2548 \\
 &= 5030.30 + 662.48 \\
 &= 5692.78
 \end{aligned}$$

The amount of Jose's federal tax is \$5692.78.

$$\begin{aligned}
 21. \text{ Federal tax} &= 17\% \text{ of } 29\,590 + 26\% \text{ of } 29\,590 + 29\% \text{ of } (65\,160 - 59\,180) \\
 &= 0.17 \times 29\,590 + 0.26 \times 29\,590 + 0.29 \times 5980 \\
 &= 5030.30 + 7693.40 + 1734.20 \\
 &= 14\,457.90
 \end{aligned}$$

The amount of Jackie's federal tax is \$14 457.90.

Section 1: Activity 2 (continued)

22. Provincial tax = 45.5% of basic federal tax
$$= 0.455 \times 3620.50$$
$$= 1647.33$$

Paul's provincial tax is \$1647.33.

23. Provincial tax = 50.5% of basic federal tax
$$= 0.505 \times 2815.17$$
$$= 1421.66$$

Ellen's provincial tax is \$1421.66.

25. Provincial tax = 50% of basic federal tax
$$= 0.50 \times 3015.89$$
$$= 1507.95$$

Mohammed's provincial tax is \$1507.95.

27. Gross annual income = 3500×12
$$= 42\,000$$

The maximum annual contributory earnings for CPP is \$36 900.

$\therefore$ Annual CPP contribution = 3.2% of $(36\,900 - 3500)$
$$= 0.032 \times 33\,400$$
$$= 1068.80$$

Annual EI contribution = 2.7% of 42 000
$$= 0.027 \times 42\,000$$
$$= 1134$$

The maximum EI contribution is \$1053.

Therefore, Kerri's annual CPP contribution is \$1068.80 and her annual EI premium is \$1053.

Taxable income = gross annual income – tax-exempt deductions

$$\begin{aligned}
 &= 42\,000 - (25.50 + 200) \times 12 \\
 &= 42\,000 - 225.50 \times 12 \\
 &= 42\,000 - 2706 \\
 &= 39\,294
 \end{aligned}$$

Kerri's taxable income is \$39 294.

Tax credits = basic personal tax credit + CPP contribution + EI premium

$$\begin{aligned}
 &= 6456 + 1068.80 + 1053 \\
 &= 8577.80
 \end{aligned}$$

Basic federal tax = federal tax – 17% of personal tax credits

$$\begin{aligned}
 &= 17\% \text{ of } 29\,590 + 26\% \text{ of } (39\,294 - 29\,590) - 0.17 \times 8577.80 \\
 &= 0.17 \times 29\,590 + 0.26 \times 9704 - 1458.23 \\
 &= 5030.30 + 2523.04 - 1458.23 \\
 &= 6095.11
 \end{aligned}$$

Kerri's basic federal tax is \$6095.11.

9. Provincial tax is calculated as a percent of the federal tax. Simply multiply the amount of federal tax by the provincial tax rate.

10. Textbook questions 29, 31, 33, 35, and 38 of “Applications and Problem Solving,” pp. 536 and 537

29. a. Gross annual income = 2625×12
 $= 31\,500$

Contributory earnings for CPP = gross annual income – basic CPP exemption
 $= 31\,500 - 3500$
 $= 28\,000$

Annual CPP contribution = 3.2% of 28 000
 $= 0.032 \times 28\,000$
 $= 896$

Annual EI premium = 2.7% of 31 500
 $= 0.027 \times 31\,500$
 $= 850.50$

Sonya's annual CPP contribution is \$896.00 and her annual EI premium is \$850.50.

Section 1: Activity 2 (continued)

- b. Calculate the tax credits.

$$\begin{aligned}\text{Tax credits} &= \text{basic personal credit} + \text{CPP contribution} + \text{EI premium} \\ &= 6456 + 896 + 850.50 \\ &= 8202.50\end{aligned}$$

Calculate the basic federal tax.

$$\begin{aligned}\text{Federal tax} &= 17\% \text{ of } 29\,590 + 26\% \text{ of } (31\,500 - 29\,590) \\ &= 0.17 \times 29\,590 + 0.26 \times 1910 \\ &= 5030.30 + 496.60 \\ &= 5526.90\end{aligned}$$

$$\begin{aligned}\text{Basic federal tax} &= \text{federal tax} - 17\% \text{ of tax credits} \\ &= 5526.90 - 0.17 \times 8202.50 \\ &= 5526.90 - 1394.43 \\ &= 4132.48\end{aligned}$$

Calculate the provincial tax.

$$\begin{aligned}\text{Provincial tax} &= 50.5\% \text{ of basic federal tax} \\ &= 0.505 \times 4132.48 \\ &= 2086.90\end{aligned}$$

Due to rounding, the basic federal tax should be \$4132.48, not \$4132.47.

$$\begin{aligned}5526.90 - 0.17 \times 8202.50 \\ = 5526.90 - 1394.425 \\ = 4132.475\end{aligned}$$

This adjustment will only occur when the thousand digit is a 5.

$$\begin{aligned}\therefore \text{Total tax payable} &= \text{basic federal tax} + \text{provincial tax} \\ &= 4132.48 + 2086.90 \\ &= 6219.38\end{aligned}$$

Sonya's total amount of income tax is \$6219.38.

$$\begin{aligned}31. \text{ Gross annual income} &= 4818.21 \times 12 \\ &= 57\,818.52\end{aligned}$$

$$\text{CPP contributions} = 1068.80 \quad \leftarrow \text{The maximum contributory earnings is } \$36\,000.$$

$$\text{EI premium} = 1053 \quad \leftarrow \text{The maximum contributory earnings is } \$39\,000.$$

$$\begin{aligned}
 \text{Annual tax-exempt deductions} &= (57 + 500) \times 12 \\
 &= 557 \times 12 \\
 &= 6684
 \end{aligned}$$

$$\begin{aligned}
 \text{Annual taxable income} &= 57\,818.52 - 6684 \\
 &= 51\,134.52
 \end{aligned}$$

$$\begin{aligned}
 \text{Federal tax} &= 17\% \text{ of } 29\,590 + 26\% \text{ of } (51\,134.52 - 29\,590) \\
 &= 0.17 \times 29\,590 + 0.26 \times 21\,544.52 \\
 &= 5030.30 + 5601.58 \\
 &= 10\,631.88
 \end{aligned}$$

$$\begin{aligned}
 \text{Tax credits} &= \text{basic personal tax credit} + \text{CPP} + \text{EI} \\
 &= 6456 + 1068.80 + 1053 \\
 &= 8577.80
 \end{aligned}$$

$$\begin{aligned}
 \text{Basic federal tax} &= \text{federal tax} - 17\% \text{ of tax credits} \\
 &= 10\,631.88 - 0.17 \times 8577.80 \\
 &= 10\,631.88 - 1458.23 \\
 &= 9173.65
 \end{aligned}$$

$$\begin{aligned}
 \text{Alberta provincial tax} &= 45.5\% \text{ of } 9173.65 \\
 &= 0.455 \times 9173.65 \\
 &= 4174.01
 \end{aligned}$$

$$\begin{aligned}
 \text{Total income tax} &= \text{federal tax} + \text{Alberta tax} \\
 &= 9173.65 + 4174.01 \\
 &= 13\,347.66
 \end{aligned}$$

$$\begin{aligned}
 \text{Total deductions} &= \text{CPP} + \text{EI} + \text{income tax} + \text{tax-exempt deductions} + \text{health insurance} \\
 &= 1068.80 + 1053 + 13\,347.66 + 6684 + 23 \times 12 \\
 &= 22\,429.46
 \end{aligned}$$

$$\begin{aligned}
 \text{Net annual income} &= \text{gross annual income} - \text{total deductions} \\
 &= 57\,818.52 - 22\,429.46 \\
 &= 35\,389.06
 \end{aligned}$$

Carla's net annual income is \$35 389.06.

Section 1: Activity 2 (continued)

$$\begin{aligned}
 33. \quad \text{a.} \quad \text{Gross monthly income} &= \text{gross monthly earnings} + \text{average commission} \\
 &= 1250 + 0.10(52\,300 - 35\,000) \\
 &= 1250 + 0.10(17\,300) \\
 &= 1250 + 1730 \\
 &= 2980
 \end{aligned}$$

Felix's gross income for an average month is \$2980.

$$\begin{aligned}
 \text{b.} \quad \text{Gross annual income} &= 2980 \times 12 \\
 &= 35\,760
 \end{aligned}$$

$$\begin{aligned}
 \text{CPP contribution} &= 3.2\% \text{ of } (35\,760 - 3500) \\
 &= 0.032 \times 32\,260 \\
 &= 1032.32
 \end{aligned}$$

$$\begin{aligned}
 \text{EI premium} &= 2.7\% \text{ of } 35\,760 \\
 &= 0.027 \times 35\,760 \\
 &= 965.52
 \end{aligned}$$

$$\begin{aligned}
 \text{Annual taxable income} &= \text{gross annual income} - \text{tax-exempt deductions} \\
 &= 35\,760 - 2\% \text{ of } 35\,760 \\
 &= 35\,760 - 0.02 \times 35\,760 \\
 &= 35\,760 - 715.20 \\
 &= 35\,044.80
 \end{aligned}$$

$$\begin{aligned}
 \text{Federal tax} &= 17\% \text{ of } 29\,590 + 26\% \text{ of } (35\,044.80 - 29\,590) \\
 &= 0.17 \times 29\,590 + 0.26 \times 5454.80 \\
 &= 5030.30 + 1418.25 \\
 &= 6448.55
 \end{aligned}$$

$$\begin{aligned}
 \text{Tax credits} &= \text{basic tax credit} + \text{CPP} + \text{EI} \\
 &= 11\,836 + 1032.32 + 965.52 \\
 &= 13\,833.84
 \end{aligned}$$

$$\begin{aligned}
 \text{Basic federal tax} &= \text{federal tax} - 17\% \text{ of } 13\,833.84 \\
 &= 6448.55 - 0.17 \times 13\,833.84 \\
 &= 6448.55 - 2351.75 \\
 &= 4096.80
 \end{aligned}$$

$$\begin{aligned}
 \text{B.C. provincial tax} &= 50.5\% \text{ of } 4096.80 \\
 &= 0.505 \times 4096.80 \\
 &= 2068.88
 \end{aligned}$$

$$\begin{aligned}
 \text{Total income tax} &= \text{federal tax} + \text{provincial tax} \\
 &= 4096.80 + 2068.88 \\
 &= 6165.68
 \end{aligned}$$

$$\begin{aligned}
 \text{Total deductions} &= \text{CPP} + \text{EI} + \text{income tax} + \text{RPP contribution} \\
 &= 1032.32 + 965.52 + 6165.68 + 715.20 \\
 &= 8878.72
 \end{aligned}$$

$$\begin{aligned}
 \text{Net annual income} &= \text{gross annual income} - \text{total deductions} \\
 &= 35\,760 - 8878.72 \\
 &= 26\,881.28
 \end{aligned}$$

Felix's net annual income is \$26 881.28.

$$\begin{aligned}
 \text{35. a. Contributory earnings} &= \text{gross annual income} - \text{basic CPP exemption} \\
 &= 35\,000 - 3500 \\
 &= 31\,500
 \end{aligned}$$

$$\begin{aligned}
 \text{Contribution in 1998} &= 3.2\% \text{ of } 31\,500 \\
 &= 0.032 \times 31\,500 \\
 &= 1008
 \end{aligned}$$

$$\begin{aligned}
 \text{Contribution in 2016} &= 5.05\% \text{ of } 31\,500 \\
 &= 0.0505 \times 31\,500 \\
 &= 1590.75
 \end{aligned}$$

$$\begin{aligned}
 \text{Difference} &= 1590.75 - 1008 \\
 &= 582.75
 \end{aligned}$$

Employee share of CPP:

$$\begin{aligned}
 \frac{10.1\%}{2} &= 5.05\% \\
 &= 0.0505
 \end{aligned}$$

The employee's CPP contribution will be \$582.75 more in 2016 than in 1998.

Section 1: Activity 2 (continued)

- b. The government might feel that the increases to CPP contributions are necessary in order to keep the Canada Pension Plan viable. With an increasing number of pensioners and a decreasing number of employees making contributions, increases to the rate of contribution are necessary so that future generations will have a Canada Pension Plan when they retire.
38. To answer this question, you will have to calculate the income tax deducted for intervals of 5000 (or 7500) from 0 to 75 000. Use a spreadsheet to calculate the income tax deducted and to create a graph. A sample is provided for you.

	A	B	C	D	E	F	G	H
	Gross/ Taxable Income	CPP	EI	Basic Tax Credit	Tax Credit	Basic Federal Tax	Alberta Provincial Tax	Total Income Tax
1								
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	5,000.00	48.00	135.00	6,456.00	6,639.00	0.00	0.00	0.00
4	10,000.00	208.00	270.00	6,456.00	6,934.00	521.22	237.16	758.38
5	15,000.00	368.00	405.00	6,456.00	7,229.00	1,321.07	601.09	1,922.16
6	20,000.00	528.00	540.00	6,456.00	7,524.00	2,120.92	965.02	3,085.94
7	25,000.00	688.00	675.00	6,456.00	7,819.00	2,920.77	1,328.95	4,249.72
8	30,000.00	848.00	810.00	6,456.00	8,114.00	3,757.52	1,709.67	5,467.19
9	35,000.00	1,008.00	945.00	6,456.00	8,409.00	5,007.37	2,278.35	7,285.72
10	40,000.00	1,068.80	1,053.00	6,456.00	8,577.80	6,278.67	2,856.80	9,135.47
11	45,000.00	1,068.80	1,053.00	6,456.00	8,577.80	7,578.67	3,448.30	11,026.97
12	50,000.00	1,068.80	1,053.00	6,456.00	8,577.80	8,878.67	4,039.80	12,918.47
13	55,000.00	1,068.80	1,053.00	6,456.00	8,577.80	10,178.67	4,631.30	14,809.97
14	60,000.00	1,068.80	1,053.00	6,456.00	8,577.80	11,503.27	5,233.99	16,737.26
15	65,000.00	1,068.80	1,053.00	6,456.00	8,577.80	12,953.27	5,893.74	18,847.01
16	70,000.00	1,068.80	1,053.00	6,456.00	8,577.80	14,403.27	6,553.49	20,956.76
17	75,000.00	1,068.80	1,053.00	6,456.00	8,577.80	15,853.27	7,213.24	23,066.51
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								

The figures on your graph may vary slightly but the general trend should be similar.

11. Textbook questions 8 and 9 of “Using the Strategies,” p. 575

$$\begin{array}{rcl}
 8. & \text{DEF} & 148 \\
 & \text{DEF} & 148 \\
 & \hline +\text{DEF} & = & \hline +148 \\
 & \text{EEE} & 444
 \end{array}$$

$\therefore D = 1, E = 4, \text{ and } F = 8$

9. Answers may vary. Sample answers are given.

$$441 = 21^2$$

$$1444 = 38^2$$

$$11\,449 = 107^2$$

Section 1: Activity 3**1. Textbook questions 1 to 5 of Investigation 1, “Understanding a Bank Statement,” p. 567**

1. a. The opening balance of Marina’s November statement will be \$1807.00.
- b. A debit is a transaction that is deducted from the account, and a credit is a transaction that is added to the account.
2. a. A direct debit is a transaction that is made using a debit card to pay for an item in a store or to pay a bill; an instant-teller withdrawal is a cash withdrawal made at a bank machine.
- b. Other terms that are used are purchase and withdrawal.
3. Cheque 431 appears on the statement before cheque 430 because it arrived at the bank before cheque 430.
4. Yes, it is possible for a negative quantity to appear in the balance column. This would indicate that you are overdrawn on your account.
5. In this month’s statement there are five debit transactions and one direct debit for a total charge of \$4.00. Based on this month’s transactions, Option B is better for Marina’s account because it is less expensive.

Section 1: Activity 3 (continued)

2. Textbook questions 1 to 3 of Investigation 2, “Reconciling a Bank Statement with a Personal Transaction Record,” p. 569

1. Answers may vary. The following types of errors might be found in a personal transaction record:
 - error in calculations
 - incorrect entry
 - transaction entered in the wrong column
 - date entered incorrectly
2. Answers may vary. An error might occur on the bank statement when a transaction is omitted or when an amount is entered incorrectly.
3. a. The error occurs on February 15. Richard entered \$88.95 instead of \$88.59. The following is the corrected transaction record.

D-Deposit DC-Debit Card ABM-Teller Machine AP-Automatic Payment TT-Telephone Transfer O-Other							
Date	Cheque Number	Transaction Type	Description of Transaction	Payment/Debit	✓	Deposit/Credit	Balance Forward
Feb-2		D	cash		✓	500.00	500.00
Feb-5	001	cheque	Don's Discs	78.00	✓		422.00
Feb-8		ABM	cash	100.00	✓		322.00
Feb-14		D	paycheque		✓	126.00	448.00
Feb-15	002	cheque	shoes	88.59	✓		359.41
Feb-20		ABM	cash	100.00	✓		259.41
Feb-25	003	cheque	jeans	54.69			204.71
Mar-1		D	paycheque			328.00	532.72
Mar-3		ABM	cash	100.00			432.72
Feb-28		O	service charge	5.95	✓		426.77

b.	Bank statement balance	253.46
	+Outstanding deposits/credits	328.00
	Subtotal	581.46
	–Outstanding payments/debits	154.69
		426.77

Because the final balance matches the new balance in Richard's personal transaction record, the account had been reconciled.

3. $\text{New balance} = 1344.68 + 0.56 + 600.00$
 $= 1945.24$

The new balance is \$1945.24.

4. Calculate the cash sales.

$$1258.79 - (258.68 + 587.45) = 1258.79 - 846.13$$

$$= 412.66$$

There was \$412.66 in cash sales.

Calculate the amount of cash in the cash register.

$$412.66 + 50.00 = 462.66$$

There was \$462.66 in the cash register.

5. Textbook question 12 of “Using the Strategies,” p. 575

12. a.	219	b.	273	327
	438		546	654
	657		819	981

Section 1: Activity 4

1. a. Textbook question “Explore: Complete the Table,” p. 538

Year	Principal (\$) (at the beginning of the year)	Interest Rate (%)	Amount (\$) (at the end of the year)
1	1000.00	5.5	1055.00
2	1050.00	5.5	1113.03
3	1113.03	5.5	1174.25
4	1174.25	5.5	1238.83
5	1238.83	5.5	1306.97
6	1306.97	5.5	1378.85

Section 1: Activity 4 (continued)

b. Textbook questions 1 to 4 of “Inquire,” p. 538

1. $\text{Interest} = \text{Amount at end of 6 years} - \text{Principal at beginning of first year}$
 $= 1378.85 - 1000.00$
 $= 378.85$

The amount of interest earned on Serena’s GIC is \$378.85.

2. $I = Prt$
 $= 1000 \times 0.055 \times 6$
 $= 330$

The amount of simple interest over 6 years would have been \$330.00.

3. $\text{Difference} = 378.85 - 330.00$
 $= 48.85$

The simple interest is \$48.85 less than the compound interest. People may want simple interest when paying interest on a loan or purchase.

4. a. $I = Prt$
 $= 100 \times 0.50 \times 4$
 $= 200$

$$\begin{aligned}\text{Amount} &= \text{Principal} + \text{Interest} \\ &= 100 + 200 \\ &= 300\end{aligned}$$

The amount paid would have been \$300.00.

b.

Year	Principal (\$)	Interest Rate (%)	Amount (\$)
1	100.00	50	150.00
2	150.00	50	225.00
3	225.00	50	337.50
4	337.50	50	506.25

The amount paid after 4 years would have been \$506.25.

2. Two kinds of Canada Savings Bonds are regular Canada Savings Bonds and compound Canada Savings Bonds. Regular Canada Savings Bonds earn simple interest and each year the interest is deposited into the owner's bank account or mailed to the owner. Compound Canada Savings Bonds earn compound interest. When this bond is cashed, the entire amount of the bond, including interest, is paid out.
3. a. The amount for the compound Canada Saving Bond is increasing faster starting in the second year because the interest is earned on both the principal and interest from the previous year.
- b. The graph of the amount for the compound Canada Savings Bond rises faster than the graph of the amount for the regular Canada Savings Bond.
4. Textbook questions 1 to 5, 7, 9, 11, 13, and 14 of "Practice," pp. 542 and 543

$$1. \quad i = \frac{8\%}{2}$$

$$= 4\%$$

The interest rate for a semi-annual compounding period is 4%.

$$2. \quad i = \frac{8\%}{4}$$

$$= 2\%$$

The interest rate for a quarterly compounding period is 2%.

$$3. \quad i = \frac{8\%}{12}$$

$$\doteq 0.667\%$$

The interest rate for a monthly compounding period is approximately 0.667%.

$$4. \quad i = \frac{8\%}{365}$$

$$0.022\%$$

The interest rate for a daily compounding period is approximately 0.022%.

$$5. \quad n = 2 \times 3$$

$$= 6$$

There are 6 interest periods.

Section 1: Activity 4 (continued)

$$\begin{aligned} 7. \quad n &= 1 \times 5 \\ &= 5 \end{aligned}$$

There are 5 interest periods.

$$\begin{aligned} 9. \quad n &= 12 \times \frac{1}{2} \\ &= 6 \end{aligned}$$

There are 6 interest periods.

$$\begin{aligned} 11. \quad n &= 365 \times \frac{31}{365} \\ &= 31 \end{aligned}$$

There are 31 interest periods.

$$\begin{aligned} 13. \quad i &= \frac{6\%}{4} & n &= 4 \times 3 \\ &= 1.5\% & &= 12 \end{aligned}$$

The interest rate per compounding period is 1.5%, and there are 12 interest periods.

$$\begin{aligned} 14. \quad i &= \frac{6\%}{2} & n &= 2 \times 6 \\ &= 3\% & &= 12 \end{aligned}$$

The interest rate per compounding period is 3%, and there are 12 interest periods.

5. a. Textbook questions 18, 19, 21, 23, and 25 of “Practice,” p. 543

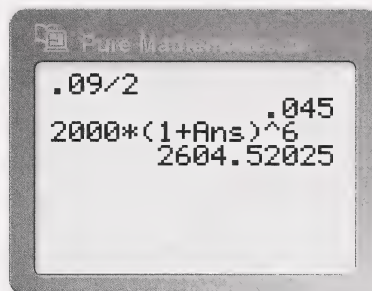
18. $P = 2000$

$$i = \frac{9\%}{2} = 0.045$$

$$n = 2 \times 3 = 6$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1+0.045)^6 \\ &= 2604.52\end{aligned}$$

The amount owing is \$2604.52.



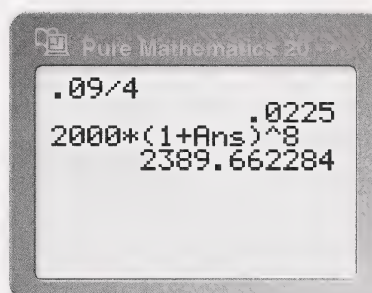
19. $P = 2000$

$$i = \frac{9\%}{4} = 0.0225$$

$$n = 4 \times 2 = 8$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1+0.0225)^8 \\ &= 2389.66\end{aligned}$$

The amount owing is \$2389.66.



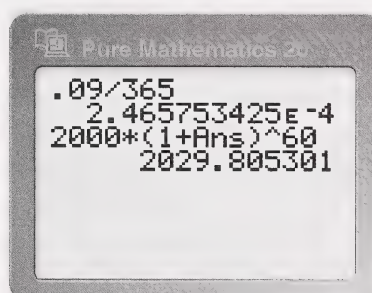
21. $P = 2000$

$$i = \frac{9\%}{365} = \frac{0.09}{365}$$

$$n = 365 \times \frac{60}{365} = 60$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000\left(1 + \frac{0.09}{365}\right)^{60} \\ &= 2029.81\end{aligned}$$

The amount owing is \$2029.81.



Section 1: Activity 4 (continued)

23. $P = 500$

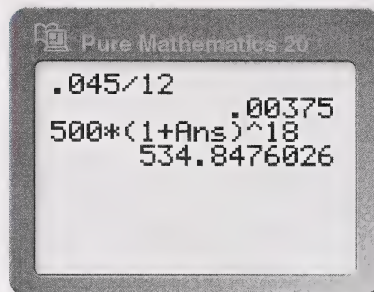
$$i = \frac{4.5\%}{12} = 0.00375$$

$$n = 12 \times 1.5 = 18$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 500(1+0.00375)^{18} \\ &= 534.85\end{aligned}$$

$$\begin{aligned}\text{Interest earned} &= A - P \\ &= 534.85 - 500 \\ &= 34.85\end{aligned}$$

The interest earned is \$34.85.



25. $P = 500$

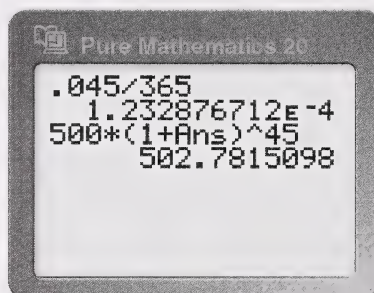
$$i = \frac{4.5\%}{365} = \frac{0.045}{365}$$

$$n = 365 \times \frac{45}{365} = 45$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 500\left(1 + \frac{0.045}{365}\right)^{45} \\ &= 502.78\end{aligned}$$

$$\begin{aligned}\text{Interest earned} &= A - P \\ &= 502.78 - 500 \\ &= 2.78\end{aligned}$$

The interest earned is \$2.78.



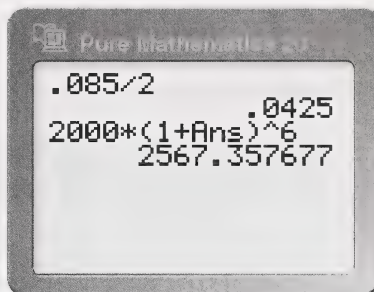
b. Textbook questions 29 and 33 of “Applications and Problem Solving,” p. 543

29. $P = 2000$

$$i = \frac{8.5\%}{2} = 0.0425$$

$$n = 2 \times 3 = 6$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1+0.0425)^6 \\ &= 2567.36\end{aligned}$$



The amount owing after three years is \$2567.36.

33. a. Option C will earn the most interest because it has the most compounding periods.

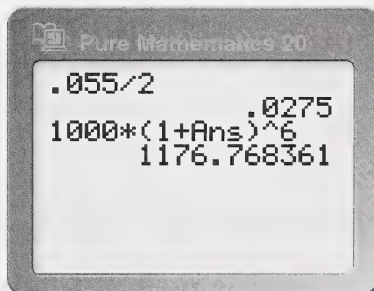
b. Option A (worst)

$$P = 1000$$

$$i = \frac{5.5\%}{2} = 0.0275$$

$$n = 2 \times 3 = 6$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 1000(1+0.0275)^6 \\ &= 1176.77\end{aligned}$$



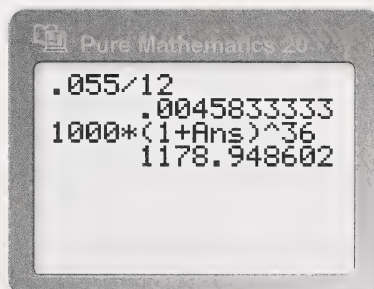
Option C (best)

$$P = 1000$$

$$i = \frac{5.5\%}{12} = \frac{0.055}{12}$$

$$n = 12 \times 3 = 36$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 1000\left(1 + \frac{0.055}{12}\right)^{36} \\ &= 1178.95\end{aligned}$$



$$\begin{aligned}\text{Difference} &= 1178.95 - 1176.77 \\ &= 2.18\end{aligned}$$

The best option earns \$2.18 more interest than the worst option.

Section 1: Activity 4 (continued)

6. a. Textbook question “Explore: Use a Table,” p. 547

Your completed table should be similar to the following.

	Principal (\$)	Nominal Annual Interest Rate (%)	Compound Period	Amount (\$)
A	100	4	semi-annually	104.04
B	100	5	quarterly	105.09
C	100	9.76	semi-annually	110.00
D	100	9.65	quarterly	110.00

b. Textbook questions 1 to 4 of “Inquire,” p. 547

1. The interest earned for each investment is as follows:

A: \$4.04

B: \$5.09

C: \$10.00

D: \$10.00

$$\begin{aligned}
 2. \text{ A: simple interest rate} &= \frac{4.04}{100} \\
 &= .0404 \\
 &= 4.04\%
 \end{aligned}$$

$$\begin{aligned}
 \text{B: simple interest rate} &= \frac{5.09}{100} \\
 &= .0509 \\
 &= 5.09\%
 \end{aligned}$$

$$\begin{aligned}
 \text{C: simple interest rate} &= \frac{10.00}{100} \\
 &= .10000 \\
 &= 10.00\%
 \end{aligned}$$

$$\begin{aligned}
 \text{D: simple interest rate} &= \frac{10.00}{100} \\
 &= .10000 \\
 &= 10.00\%
 \end{aligned}$$

3. Yes, investments C and D have different nominal rates but the same effective rates.

$$\begin{aligned}
 4. \text{ a. Interest} &= 100 \times 0.48 \times 12 \\
 &= 576
 \end{aligned}$$

You would owe \$576 in interest.

$$\begin{aligned}
 \text{b. effective annual rate of interest} &= \frac{\text{amount of interest}}{\text{principal}} \times 100\% \\
 &= \frac{576}{100} \times 100\% \\
 &= 576\%
 \end{aligned}$$

The effective annual rate of interest is 576%.

7. No, such an extreme effective annual rate of interest would not be tolerated today.
8. To calculate the effective annual rate of interest, first calculate the amount of interest for one year using the given nominal rate of interest; then divide the amount of interest by the amount of the loan or investment. This is the effective annual rate of interest as a decimal. To change the effective rate of interest to a percent, multiply by 100%.

9. a. Textbook questions 1, 2, 3, 8, and 10 of “Practice,” p. 549

1. $P = 100$, $i = \frac{8\%}{2} = 0.04$, and $n = 2$

$$\therefore A = P(1+i)^n$$

$$= 100(1+0.04)^2$$

$$= 108.16$$

$$\text{Interest} = A - P$$

$$= 108.16 - 100.00$$

$$= 8.16$$

If the interest earned in one year on an investment of \$100 is \$8.16, then the simple interest rate is 8.16% per annum.

Therefore, a nominal interest rate of 8% per annum, compounded semi-annually, is equivalent to an effective annual interest rate of 8.16%.

2. $P = 100$, $i = \frac{8\%}{4} = 0.02$, and $n = 4$

$$\therefore A = P(1+i)^n$$

$$= 100(1+0.02)^4$$

$$= 108.24$$

$$\text{Interest} = A - P$$

$$= 108.24 - 100.00$$

$$= 8.24$$

If the interest earned in one year on an investment of \$100 is \$8.24, then the simple interest rate is 8.24% per annum.

Therefore, a nominal interest rate of 8% per annum, compounded quarterly, is equivalent to an effective annual interest rate of 8.24%.

Section 1: Activity 4 (continued)

$$3. \quad P = 100, \quad i = \frac{8\%}{12} = \frac{0.08}{12}, \quad \text{and } n = 12$$

$$\therefore A = P(1+i)^n$$

$$= 100 \left(1 + \frac{0.08}{12} \right)^{12}$$

$$= 108.30$$

$$\text{Interest} = A - P$$

$$= 108.30 - 100.00$$

$$= 8.30$$

If the interest earned in one year on an investment of \$100 is \$8.30, then the simple interest rate is 8.3% per annum.

Therefore, a nominal interest rate of 8% per annum, compounded monthly, is equivalent to an effective annual interest rate of 8.3%.

$$8. \quad P = 100, \quad i = \frac{7.5\%}{4} = 0.01875, \quad \text{and } n = 4$$

$$\therefore A = P(1+i)^n$$

$$= 100(1 + 0.01875)^4$$

$$= 107.71$$

$$\text{Interest} = A - P$$

$$= 107.71 - 100$$

$$= 7.71$$

If the interest earned in one year on an investment of \$100 is \$7.71, then the simple interest rate is 7.71% per annum.

Therefore, a nominal interest rate of 7.5% per annum, compounded quarterly, is equivalent to an effective annual interest rate of 7.71%.

$$10. \quad P = 100, \quad i = \frac{4.25\%}{12} = \frac{0.0425}{12}, \quad \text{and } n = 12$$

$$\therefore A = P(1+i)^n$$

$$= 100 \left(1 + \frac{0.0425}{12} \right)^{12}$$

$$= 104.33$$

$$\text{Interest} = A - P$$

$$= 104.33 - 100$$

$$= 4.33$$

If the interest earned in one year on an investment of \$100 is \$4.33, then the simple interest rate is 4.33% per annum.

Therefore, a nominal interest rate of 4.25% per annum, compounded monthly, is equivalent to an effective annual interest rate of 4.33%.

b. Textbook questions 11, 12, and 17 of “Applications and Problem Solving,” pp. 549 and 550

11. Interest at 5.25% Compounded Semi-Annually

$$P = 1000, i = \frac{5.25\%}{2} = \frac{0.0525}{2}, \text{ and } n = 2$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 1000\left(1 + \frac{0.0525}{2}\right)^2 \\ &= 1053.19\end{aligned}$$

Interest at 5% Compounded Daily

$$P = 1000, i = \frac{5\%}{365} = \frac{0.05}{365}, \text{ and } n = 365$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 1000\left(1 + \frac{0.05}{365}\right)^{365} \\ &= 1051.27\end{aligned}$$

It is better to invest at 5.25% per annum, compounded semi-annually.

$$\begin{aligned}\text{Difference} &= 1053.19 - 1051.27 \\ &= 1.92\end{aligned}$$

There is \$1.92 more interest earned the first year if you invest \$1000 at 5.25% per annum, compounded semi-annually.

- 12. a.** Answers may vary. Your prediction could be either A or B. Although, with a 0.5% difference, situation A is more likely to be the better investment.

b. Investment A

$$P = 2000, i = \frac{8.5\%}{4} = 0.02125, \text{ and } n = 4$$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1 + 0.02125)^4 \\ &= 2175.50\end{aligned}$$

$$\begin{aligned}\text{Interest} &= A - P \\ &= 2175.50 - 2000.00 \\ &= 175.50\end{aligned}$$

$$\begin{aligned}\text{Effective annual interest rate} &= \frac{\text{amount of interest per year}}{\text{principal}} \times 100\% \\ &= \frac{175.50}{2000} \times 100\% \\ &= 8.77\%\end{aligned}$$

Section 1: Activity 4 (continued)

Investment B

$$P = 2000, i = \frac{8\%}{12} = \frac{0.08}{12}, \text{ and } n = 12$$

$$\begin{aligned} \therefore A &= P(1+i)^n & \text{Interest} &= A - P \\ &= 2000\left(1 + \frac{0.08}{12}\right)^{12} & &= 2166.00 - 2000.00 \\ &= 2166.00 & &= 166.00 \end{aligned}$$

$$\begin{aligned} \text{Effective annual interest rate} &= \frac{\text{amount of interest per year}}{\text{principal}} \times 100\% \\ &= \frac{166.00}{2000} \times 100\% \\ &= 8.30\% \end{aligned}$$

Investment A is better because it has a higher effective annual rate of interest.

17. a. Determine the interest earned in one year to calculate the effective annual interest rate for each option.

Option A

$$P = 3000, i = \frac{6.9\%}{2} = 0.0345, \text{ and } n = 2$$

$$\begin{aligned} \therefore A &= P(1+i)^n & \text{Interest} &= 3210.57 - 3000.00 \\ &= 3000(1 + 0.0345)^2 & &= 210.57 \\ &= 3210.57 \end{aligned}$$

$$\begin{aligned} \text{Effective annual interest rate} &= \frac{\text{amount of interest per year}}{\text{principal}} \times 100\% \\ &= \frac{210.57}{3000} \times 100\% \\ &= 7.02\% \end{aligned}$$

The effective annual interest rate for Option A is 7.02%.

Option B

$$P = 3000, i = 7.2\% = 0.072, \text{ and } n = 1$$

$$\begin{aligned} \therefore A &= P(1+i)^n & \text{Interest} &= 3216 - 3000 \\ &= 3000(1+0.072)^1 & &= 216 \\ &= 3216 \end{aligned}$$

$$\begin{aligned} \text{Effective annual interest rate} &= \frac{\text{amount of interest per year}}{\text{principal}} \times 100\% \\ &= \frac{216}{3000} \times 100\% \\ &= 7.2\% \end{aligned}$$

The effective annual interest rate for Option B is 7.2%.

- b. Dara might want the lower effective rate—particularly if she thinks interest rates will drop in the next few years—because it is for a longer term.

10. Textbook question 20 of “Applications and Problem Solving,” p. 550

20. Use the formula or use a spreadsheet and trial and error to determine the nominal rate of interest.

$$\begin{aligned} A &= P(1+i)^n \\ 226.86 &= 200(1+i)^4 & \leftarrow \text{There are 4 semi-annual periods in 2 years.} \\ (1+i)^4 &= \frac{226.86}{200} \\ 1+i &= \sqrt[4]{\frac{226.86}{200}} \\ 1+i &\doteq 1.032 \\ i &\doteq 0.032 \text{ or } 3.2\% \end{aligned}$$

A nominal interest rate of approximately $2 \times 3.2\% = 6.4\%$ per annum, compounded semi-annually, will yield the same amount after 2 years as an effective rate of 6.5%.

Section 1: Activity 4 (continued)

11. Textbook questions 1, 3, 5, 7, 9, 11, 13, 15, and 17 of “Mental Math,” p. 525

- | | | |
|-----------|-----------|------------|
| 1. \$8.75 | 3. \$6.00 | 5. \$48.00 |
| 7. \$1.50 | 9. \$15 | 11. 5.5% |
| 13. 13% | 15. 0.1% | 17. 0.5% |

Section 1: Activity 5

1. a. =D3

b. =B4+B4*0.055

Note: If column C is formatted as a percent, then the formula for cell D4 could be “=B4+B4*C4.”

c. Yes, most spreadsheets will automatically adjust for the new row number when you copy and paste a formula.

2. a. Textbook questions 20 and 22 of “Practice,” p. 543

20. Your completed spreadsheet should be similar to the following.

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$2,000.00		
4	Interest Rate Per Annum	9.00%		
5	Interest Rate Per Period	9.00%		
6				
7	Period	Principal	Interest	Amount
8	1	\$2,000.00	\$180.00	\$2,180.00
9	2	\$2,180.00	\$196.20	\$2,376.20
10	3	\$2,376.20	\$213.86	\$2,590.06
11	4	\$2,590.06	\$233.11	\$2,823.16
12	5	\$2,823.16	\$254.08	\$3,077.25

22. Your spreadsheet should be similar to the following.

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$500.00		
4	Interest Rate Per Annum	4.50%		
5	Interest Rate Per Period	2.25%		
6				
7	Period	Principal	Interest	Amount
8	1	\$500.00	\$11.25	\$511.25
9	2	\$511.25	\$11.50	\$522.75
10	3	\$522.75	\$11.76	\$534.52
11	4	\$534.52	\$12.03	\$546.54
12	5	\$546.54	\$12.30	\$558.84
13	6	\$558.84	\$12.57	\$571.41
14	7	\$571.41	\$12.86	\$584.27
15	8	\$584.27	\$13.15	\$597.42

b. Textbook question 33 of “Applications and Problem Solving,” p. 543

33. a. Your prediction should be the same as when you did this question previously. Option C should earn the most interest since it has the most compounding periods.
- b. Create a spreadsheet to compare Option A and Option C. Your spreadsheets should look like the following.

Option A

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$1,000.00		
4	Interest Rate Per Annum	5.50%		
5	Interest Rate Per Period	2.75%		
6				
7	Period	Principal	Interest	Amount
8	1	\$1,000.00	\$27.50	\$1,027.50
9	2	\$1,027.50	\$28.26	\$1,055.76
10	3	\$1,055.76	\$29.03	\$1,084.79
11	4	\$1,084.79	\$29.83	\$1,114.62
12	5	\$1,114.62	\$30.65	\$1,145.27
13	6	\$1,145.27	\$31.50	\$1,176.77

Section 1: Activity 5 (continued)

Option C

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$1,000.00		
4	Interest Rate Per Annum	5.50%		
5	Interest Rate Per Period	0.46%		
6				
7	Period	Principal	Interest	Amount
8	1	\$1,000.00	\$4.58	\$1,004.58
9	2	\$1,004.58	\$4.60	\$1,009.19
10	3	\$1,009.19	\$4.63	\$1,013.81
11	4	\$1,013.81	\$4.65	\$1,018.46
12	5	\$1,018.46	\$4.67	\$1,023.13
13	6	\$1,023.13	\$4.69	\$1,027.82
14	7	\$1,027.82	\$4.71	\$1,032.53
15	8	\$1,032.53	\$4.73	\$1,037.26
16	9	\$1,037.26	\$4.75	\$1,042.01
17	10	\$1,042.01	\$4.78	\$1,046.79
18	11	\$1,046.79	\$4.80	\$1,051.59
19	12	\$1,051.59	\$4.82	\$1,056.41
20	13	\$1,056.41	\$4.84	\$1,061.25
21	14	\$1,061.25	\$4.86	\$1,066.11
22	15	\$1,066.11	\$4.89	\$1,071.00
23	16	\$1,071.00	\$4.91	\$1,075.91
24	17	\$1,075.91	\$4.93	\$1,080.84
25	18	\$1,080.84	\$4.95	\$1,085.79
26	19	\$1,085.79	\$4.98	\$1,090.77
27	20	\$1,090.77	\$5.00	\$1,095.77
28	21	\$1,095.77	\$5.02	\$1,100.79
29	22	\$1,100.79	\$5.05	\$1,105.84
30	23	\$1,105.84	\$5.07	\$1,110.91
31	24	\$1,110.91	\$5.09	\$1,116.00
32	25	\$1,116.00	\$5.11	\$1,121.11

33	26	\$1,121.11	\$5.14	\$1,126.25
34	27	\$1,126.25	\$5.16	\$1,131.41
35	28	\$1,131.41	\$5.19	\$1,136.60
36	29	\$1,136.60	\$5.21	\$1,141.81
37	30	\$1,141.81	\$5.23	\$1,147.04
38	31	\$1,147.04	\$5.26	\$1,152.30
39	32	\$1,152.30	\$5.28	\$1,157.58
40	33	\$1,157.58	\$5.31	\$1,162.89
41	34	\$1,162.89	\$5.33	\$1,168.22
42	35	\$1,168.22	\$5.35	\$1,173.57
43	36	\$1,173.57	\$5.38	\$1,178.95

$$\begin{aligned}\text{Difference} &= 1178.95 - 1176.77 \\ &= 2.18\end{aligned}$$

Option C earned \$2.18 more in interest.

3. Textbook question 1 of Investigation 1, “Annuity Remaining,” p. 546

1. a. Column A lists the number of monthly payments.
 Column B lists the opening balance at the start of each new period.
 Column C lists the amount of interest charged for each month.
 Column D lists the payment made for each period.
 Column E lists the closing balance at the end of the period.
- b. The number of rows represents the number of payments over the life of the loan.
- c. The numerical entries represent the first period, the opening balance, and the monthly payments.
- d. The formula “=B2*0.11/12” calculates the amount of interest charged per period; the formula “=B2+C2-D2” calculates the closing balance for the first period; the formula “=A2+1” calculates the period number for the new row; and the formula “=E2” calculates the opening balance for the period, which is equal to the closing balance of the preceding period.

Section 1: Activity 5 (continued)

4. First, complete Row 3—cells C3, D3, and E3—of the spreadsheet. In cells C3 and E3, simply copy and paste the formulas from row 2; in cell D3, enter the formula “=D2”. Now, select cells A3 to E25 and complete the spreadsheet for 2 years (24 periods) by using the Fill Down feature from the Calculate menu.

Your spreadsheet should be similar to the following.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	12,000.00	110.00	400.00	11,710.00
3	2	11,710.00	107.34	400.00	11,417.34
4	3	11,417.34	104.66	400.00	11,122.00
5	4	11,122.00	101.95	400.00	10,823.95
6	5	10,823.95	99.22	400.00	10,523.17
7	6	10,523.17	96.46	400.00	10,219.63
8	7	10,219.63	93.68	400.00	9,913.31
9	8	9,913.31	90.87	400.00	9,604.19
10	9	9,604.19	88.04	400.00	9,292.22
11	10	9,292.22	85.18	400.00	8,977.40
12	11	8,977.40	82.29	400.00	8,659.70
13	12	8,659.70	79.38	400.00	8,339.08
14	13	8,339.08	76.44	400.00	8,015.52
15	14	8,015.52	73.48	400.00	7,688.99
16	15	7,688.99	70.48	400.00	7,359.48
17	16	7,359.48	67.46	400.00	7,026.94
18	17	7,026.94	64.41	400.00	6,691.35
19	18	6,691.35	61.34	400.00	6,352.69
20	19	6,352.69	58.23	400.00	6,010.92
21	20	6,010.92	55.10	400.00	5,666.02
22	21	5,666.02	51.94	400.00	5,317.96
23	22	5,317.96	48.75	400.00	4,966.71
24	23	4,966.71	45.53	400.00	4,612.24
25	24	4,612.24	42.28	400.00	4,254.52

After two years, \$4254.52 of the annuity remains.

5. Using the spreadsheet from the answer to question 4, select cells A25 to E37 and use the Fill Down feature from the Calculate menu.

Your spreadsheet should look similar to the following. **Note:** To save space, the following spreadsheet does not show rows 7 to 17 and rows 24 to 31.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	12,000.00	110.00	400.00	11,710.00
3	2	11,710.00	107.34	400.00	11,417.34
4	3	11,417.34	104.66	400.00	11,122.00
5	4	11,122.00	101.95	400.00	10,823.95
6	5	10,823.95	99.22	400.00	10,523.17

18	17	7,026.94	64.41	400.00	6,691.35
19	18	6,691.35	61.34	400.00	6,352.69
20	19	6,352.69	58.23	400.00	6,010.92
21	20	6,010.92	55.10	400.00	5,666.02
22	21	5,666.02	51.94	400.00	5,317.96
23	22	5,317.96	48.75	400.00	4,966.71

32	31	2,038.27	18.68	400.00	1,656.95
33	32	1,656.95	15.19	400.00	1,272.14
34	33	1,272.14	11.66	400.00	883.80
35	34	883.80	8.10	400.00	491.90
36	35	491.90	4.51	400.00	96.41
37	36	96.41	0.88	97.29	0.00

It will take Anita 36 periods, or 3 years, to pay off the loan. Her final payment will be \$97.29.

Section 1: Activity 5 (continued)

6. a. The amount remaining would be \$51 282.30.
- b. **Step 1:** Click on cell C2. In the formula, change 0.045 to 0.095.
Step 2: Select cells C2 to C121; then from the Calculate menu, select “Fill Down.”
- c. The amount of the payment that will reduce the annuity to approximately \$1.00 is \$1293.97. **Note:** A payment of \$1293.97 is the closest value to the nearest cent that will reduce the amount of the annuity to the lowest amount possible.
7. Textbook questions 1.a. and 1.c. of Investigation 2, “Annuity Payments,” p. 546
1. a. The amount of the monthly payment that can be made is \$701.32.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	40,000.00	266.67	701.32	39,565.35
3	2	39,565.35	263.77	701.32	39,127.80
4	3	39,127.80	260.85	701.32	38,687.33
5	4	38,687.33	257.92	701.32	38,243.92

69	68	3,438.40	22.92	701.32	2,760.00
70	69	2,760.00	18.40	701.32	2,077.08
71	70	2,077.08	13.85	701.32	1,389.61
72	71	1,389.61	9.26	701.32	697.56
73	72	697.56	4.65	701.32	0.89

- c. The amount of the monthly payment that can be made is \$1267.42.

	A	B	C	D	E
1	Month	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	85,000.00	672.92	1,267.42	84,405.50
3	2	84,405.50	668.21	1,267.42	83,806.29
4	3	83,806.29	663.47	1,267.42	83,202.33
5	4	83,202.33	658.69	1,267.42	82,593.60

92					
93	92	6,190.08	49.00	1,267.42	4,971.66
94	93	4,971.66	39.36	1,267.42	3,743.60
95	94	3,743.60	29.64	1,267.42	2,505.82
96	95	2,505.82	19.84	1,267.42	1,258.23
97	96	1,258.23	9.96	1,267.42	0.78

8. Textbook questions 36 and 37 of “Applications and Problem Solving,” p. 543

36.

	A	B	C	D
1	Compound Interest			
2				
3	Principal	\$3,653.45		
4	Interest Rate Per Annum	8.00%		
5	Interest Rate Per Period	4.00%		
6				
7	Period	Principal	Interest	Amount
8	1	\$3,653.45	\$146.14	\$3,799.59
9	2	\$3,799.59	\$151.98	\$3,951.57
10	3	\$3,951.57	\$158.06	\$4,109.63
11	4	\$4,109.63	\$164.39	\$4,274.02
12	5	\$4,274.02	\$170.96	\$4,444.98
13	6	\$4,444.98	\$177.80	\$4,622.78
14	7	\$4,622.78	\$184.91	\$4,807.69
15	8	\$4,807.69	\$192.31	\$5,000.00

The amount invested would have to be \$3653.45.

First, insert rows, using the Fill Down feature, or delete rows so that the spreadsheet only shows 8 periods, since $2 \times 4 = 8$. Second, change the interest rate per annum in cell B4 to 8% and the formula to calculate the interest rate per period in cell B5 to “=B4/2”. Finally, through trial and error, enter the principal that will yield \$5000 after the 4-year term.

Section 1: Activity 5 (continued)

37.

	A	B	C	D
1	Inflation			
2				
3	Principal	\$100.00		
4	Annual Inflation Rate	4.00%		
5				
6	Year	Principal	Inflation	Amount
7	1	\$100.00	\$4.00	\$104.00
8	2	\$104.00	\$4.16	\$108.16
9	3	\$108.16	\$4.33	\$112.49
10	4	\$112.49	\$4.50	\$116.99
11	5	\$116.99	\$4.68	\$121.67
12	6	\$121.67	\$4.87	\$126.53
13	7	\$126.53	\$5.06	\$131.59
14	8	\$131.59	\$5.26	\$136.86
15	9	\$136.86	\$5.47	\$142.33
16	10	\$142.33	\$5.69	\$148.02
17	11	\$148.02	\$5.92	\$153.95
18	12	\$153.95	\$6.16	\$160.10
19	13	\$160.10	\$6.40	\$166.51
20	14	\$166.51	\$6.66	\$173.17
21	15	\$173.17	\$6.93	\$180.09
22	16	\$180.09	\$7.20	\$187.30
23	17	\$187.30	\$7.49	\$194.79
24	18	\$194.79	\$7.79	\$202.58

It would take approximately 18 years for the price of the roller blades to double.

To answer this question, you needed to alter the spreadsheet from question 2 as follows:

- Change the principal in cell B3 to \$100.
- In cell A4, change “Interest Rate Per Annum” to “Annual Inflation Rate.”
- Change the inflation rate in cell B4 to 4%.
- Delete row 5, “Interest Rate Per Period,” entirely.
- In cell C6, change the column heading from “Interest” to “Inflation.”
- In cell C7, enter the formula “=B7*\$B\$4.”

9. a.

	A	B	C	D	E
1	Year	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	1,000.00	62.50	1,000.00	2,062.50
3	2	2,062.50	128.91	1,000.00	3,191.41
4	3	3,191.41	199.46	1,000.00	4,390.87
5	4	4,390.87	274.43	1,000.00	5,665.30
6	5	5,665.30	354.08	1,000.00	7,019.38
7	6	7,019.38	438.71	1,000.00	8,458.09
8	7	8,458.09	528.63	1,000.00	9,986.72
9	8	9,986.72	624.17	1,000.00	11,610.89
10	9	11,610.89	725.68	1,000.00	13,336.57
11	10	13,336.57	833.54	1,000.00	15,170.11
12	11	15,170.11	948.13	1,000.00	17,118.24
13	12	17,118.24	1,069.89	1,000.00	19,188.13
14	13	19,188.13	1,199.26	1,000.00	21,387.39
15	14	21,387.39	1,336.71	1,000.00	23,724.10
16	15	23,724.10	1,482.76	1,000.00	26,206.86
17	16	26,206.86	1,637.93	1,000.00	28,844.78
18	17	28,844.78	1,802.80	1,000.00	31,647.58
19	18	31,647.58	1,977.97	1,000.00	34,625.56

The amount of the investment after 18 years is \$34 625.56.

b.

	A	B	C	D	E
1	Year	Opening Balance, \$	Interest, \$	Payment, \$	Closing Balance, \$
2	1	1,000.00	47.50	1,000.00	2,047.50
3	2	2,047.50	97.26	1,000.00	3,144.76
4	3	3,144.76	149.38	1,000.00	4,294.13
5	4	4,294.13	203.97	1,000.00	5,498.10
6	5	5,498.10	261.16	1,000.00	6,759.26
7	6	6,759.26	321.07	1,000.00	8,080.33
8	7	8,080.33	383.82	1,000.00	9,464.14
9	8	9,464.14	449.55	1,000.00	10,913.69
10	9	10,913.69	518.40	1,000.00	12,432.09
11	10	12,432.09	590.52	1,000.00	14,022.62
12	11	14,022.62	666.07	1,000.00	15,688.69
13	12	15,688.69	745.21	1,000.00	17,433.90
14	13	17,433.90	828.11	1,000.00	19,262.01
15	14	19,262.01	914.95	1,000.00	21,176.96
16	15	21,176.96	1,005.91	1,000.00	23,182.86
17	16	23,182.86	1,101.19	1,000.00	25,284.05
18	17	25,284.05	1,200.99	1,000.00	27,485.04
19	18	27,485.04	1,305.54	1,000.00	29,790.58

The amount of the investment after 18 years is \$29 790.58.

Section 1: Activity 5 (continued)

c. Difference = $34\,625.56 - 29\,790.58$
 $= 4834.98$

The amount of the investment at 6.25% per annum, compounded annually, is \$4834.98 more than the amount invested at 4.75% per annum, compounded annually.

10. Textbook question 1 of “DATA BANK,” p. 575

1. a. The percent of women in the Canadian population is expected to increase.
 b. Women are expected to outnumber men in the 55-years-and-older range.
 c. Women need to save more for retirement because they tend to live longer.

11. a. Textbook questions a. and b. of “Explore: Interpret the Graph,” p. 527

- a. The average cash income was the least in Newfoundland; the average cash income was the greatest in Ontario.
- b. The average cash income in Ontario, Alberta, and British Columbia exceeded the average Canadian cash income.

b. Textbook questions 1 and 2 of “Inquire,” p. 527

1. Some provinces tend to have more higher-paying jobs.
2. No, if a family lives in a region where the cost of living is lower, then the household income can be lower without adversely affecting the family’s standard of living.

Section 1: Follow-up Activities

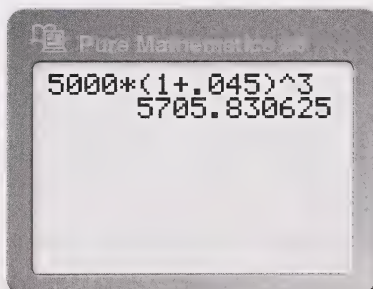
Extra Help

Textbook questions 13, 15.a., and 18 of “Review,” p. 572

13. $P = 5000$, $i = 4.5\% = 0.045$, and $n = 3$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 5000(1+0.045)^3 \\ &= 5705.83\end{aligned}$$

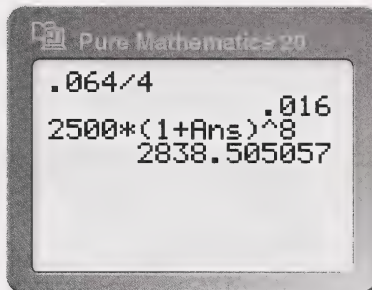
The amount is \$5705.83.



15. a. $P = 2500$, $i = \frac{6.4\%}{4} = 0.016$, and $n = 4 \times 2 = 8$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2500(1+0.016)^8 \\ &= 2838.51\end{aligned}$$

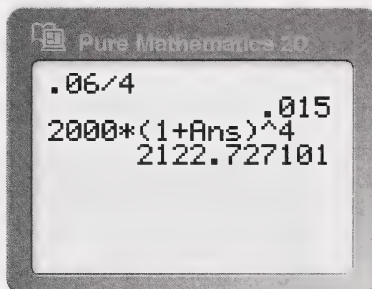
The value of Marie's investment is \$2838.51.



18. Option A

$P = 2000$, $i = \frac{6.4\%}{4} = 0.015$, and $n = 4$

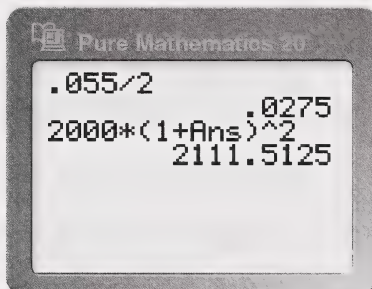
$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1+0.015)^4 \\ &= \$2122.73\end{aligned}$$



Option B

$P = 2000$, $i = \frac{5.5\%}{2} = 0.0275$, and $n = 2$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 2000(1+0.0275)^2 \\ &= \$2111.51\end{aligned}$$

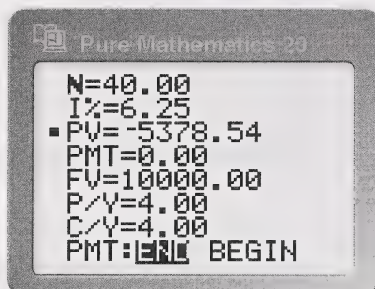


Option A is better.

Enrichment

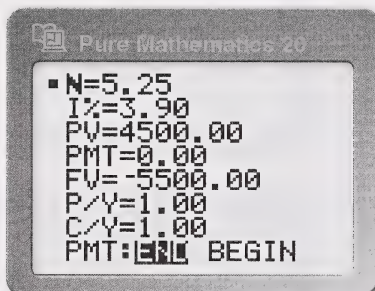
1. a. Textbook questions 1 and 2 of Investigation 1, “No Payments Made,” p. 544

1.



The amount that would have to be invested is \$5378.54.

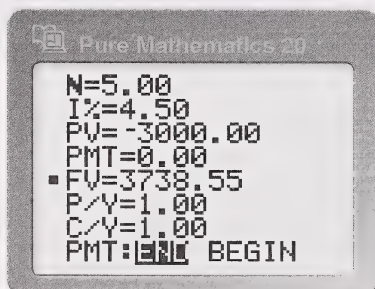
2.



Adam is due to repay the loan in 5.25 years.

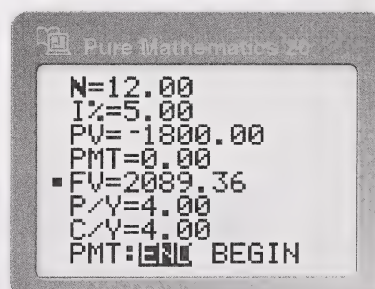
b. Textbook questions 26 and 27 of “Practice,” p. 543

26.



The amount of the RRSP investment is \$3738.55.

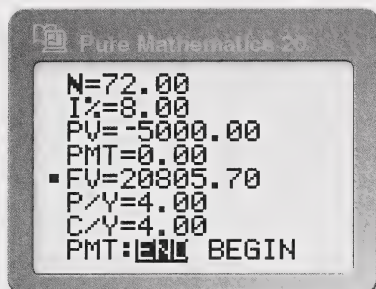
27.



The amount of the RRSP investment is \$2089.36.

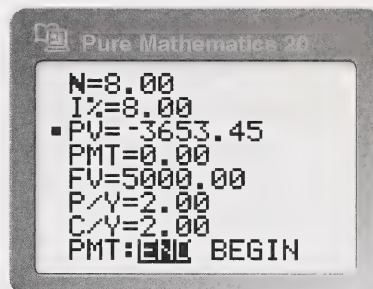
c. Textbook questions 30 and 36 of “Applications and Problem Solving,” p. 543

30.



The educational fund will be worth
 \$20 805.70 in 18 years.

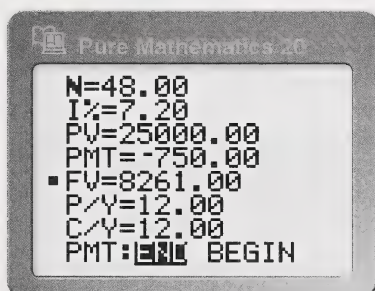
36.



You should invest \$3653.45.

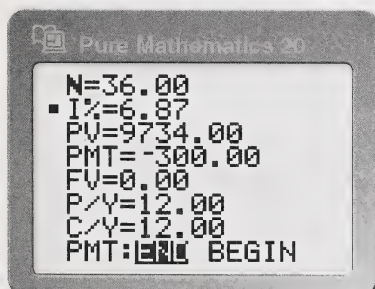
2. Textbook questions 2, 3, and 5 of Investigation 2, “Monthly Payments Made,” p. 545

2.



After 4 years, the annuity will have overpaid \$8261.00.

3.

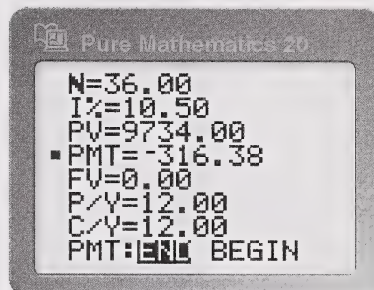


The annual rate of interest that would allow them to buy the entertainment system is 6.87%.

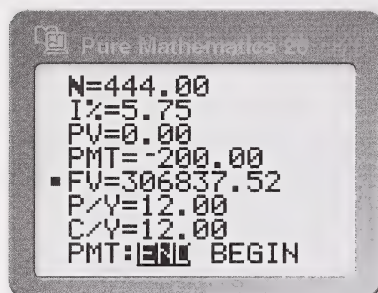
This rate is somewhat low for purchases by payments from a retail outlet. A more realistic rate would be about 10.50%.

Enrichment (continued)

To determine the payment required, change the interest rate (I%) to 10.50, move the cursor to “PMT” and press **ALPHA** [SOLVE]. You should get a value of -316.38. This means the family would have to make a payment of \$316.38 per month for 3 years in order to purchase the stereo.

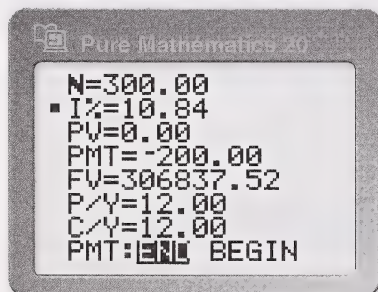


5. a.



The value of Markita's annuity when she is 60 will be \$306 837.52.

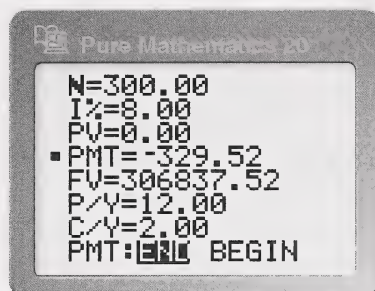
b.



Note: Markita will make only $12 \times 25 = 300$ payments.

Markita would have to have an annual interest rate of 10.84%.

- c. Change the annual interest rate to 8.00% and the compounding periods per year to 2; then determine the monthly payment.

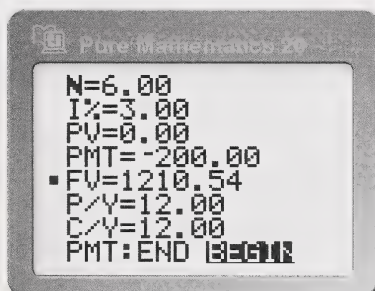


Markita would have to make a monthly payment of \$329.52.

- d. Yes, it is advantageous to invest early. Because there are more years of payments and more years of compounding interest, a smaller monthly payment is required to yield the same amount of annuity at a given age.

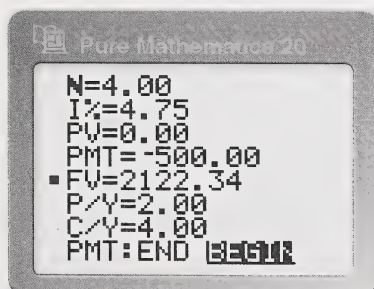
3. Textbook questions 31 and 34 of “Applications and Problem Solving” p. 543

31.



The amount in Pierre's account at the end of the sixth month is \$1210.54.

34. a.



The amount in Marla's account at the end of the second year is \$2122.34.

Enrichment (continued)

$$\begin{aligned}\text{b. Interest} &= \text{Amount} - \text{Principal} \\ &= 2122.34 - 2000.00 \\ &= 122.34\end{aligned}$$

Marla earned \$122.34 in interest.

Section 2: Activity 1

1. a. Textbook questions a. and b. of “Explore: Interpret the Information,” p. 551

$$\begin{aligned}\text{a. Cost} &= 54.90 \times 12 \\ &= 658.80\end{aligned}$$

The cost of the television on the instalment plan is \$658.80.

$$\begin{aligned}\text{b. Difference} &= 658.80 - 599.00 \\ &= 59.80\end{aligned}$$

The cost of the television under the instalment plan is \$59.80 more than the original price.

b. Textbook questions 1 and 2 of “Inquire,” p. 551

1. The store would prefer Elton to use the instalment plan rather than cash because the store makes additional money through the financing.
2. The monthly payment was calculated by multiplying the original price by 1.1, dividing the resulting amount by 12, and rounding down to the nearest cent.

$$\begin{aligned}\text{Payment} &= \frac{599 \times 1.10}{12} \\ &= 54.908 \\ &54.90\end{aligned}$$

2. a. Textbook questions 1 and 2 of “Practice,” p. 555

$$\begin{aligned}\text{1. a. Cost} &= 31.26 \times 12 \\ &= 375.12\end{aligned}$$

Michel paid \$375.12 for the bicycle.

$$\begin{aligned}
 \text{b. Finance charge} &= \text{amount paid} - \text{original price} \\
 &= 375.12 - 329.00 \\
 &= 46.12
 \end{aligned}$$

The finance charge is \$46.12.

$$\begin{aligned}
 2. \text{ a. Amount to be financed} &= \text{original price} - \text{down payment} \\
 &= 2200 - 500 \\
 &= 1700
 \end{aligned}$$

The amount to be financed is \$1700.

$$\begin{aligned}
 \text{b. Finance charge} &= \text{total monthly payments} - \text{amount financed} \\
 &= 80 \times 24 - 1700 \\
 &= 1920 - 1700 \\
 &= 220
 \end{aligned}$$

The finance charge is \$220.00.

$$\begin{aligned}
 \text{c. Cost} &= \text{down payment} + \text{total monthly payments} \\
 &= 500 + (1700 + 220) \\
 &= 2420
 \end{aligned}$$

The guitar will cost Anik \$2420.

b. Textbook questions 26 and 27 of “Applications and Problem Solving,” p. 556

$$\begin{aligned}
 26. \text{ a. Down payment} &= 15\% \text{ of } 3699 \\
 &= 0.15 \times 3699 \\
 &= 554.85
 \end{aligned}$$

The down payment is \$554.85.

$$\begin{aligned}
 \text{b. Finance charge} &= \text{total monthly payments} - \text{amount financed} \\
 &= 99 \times 36 - (3699 - 554.85) \\
 &= 3564 - 3144.15 \\
 &= 419.85
 \end{aligned}$$

The finance charge is \$419.85.

Section 2: Activity 1 (continued)

$$\begin{aligned}\text{c. Amount paid} &= \text{down payment} + \text{total monthly payments} \\ &= 554.85 + 3564.00 \\ &= 4118.85\end{aligned}$$

Justin paid \$4118.85 for the computer.

27. The option with the larger down payment will cost less since the finance charge is based on the amount financed.

3. Unless the balance from the previous month was paid in full, new purchases are subject to credit charges.

4. The credit charge is calculated by multiplying the balance due by the rate of interest charged per month.

5. a. Textbook questions 3, 5, 7, 21, and 23 of “Practice,” p. 555

$$\begin{aligned}\text{3. Credit charge} &= 1.4\% \text{ of balance due} \\ &= 0.014 \times 682.00 \\ &= 9.55\end{aligned}$$

The credit charge is \$9.55.

$$\begin{aligned}\text{5. Credit charge} &= 1.4\% \text{ of balance due} \\ &= 0.014 \times 59.45 \\ &= 0.83\end{aligned}$$

The credit charge is \$0.83.

$$\begin{aligned}\text{7. Credit charge} &= 1.5\% \text{ of } 392.00 \\ &= 0.015 \times 392.00 \\ &= 5.88\end{aligned}$$

The credit charge is \$5.88.

$$\begin{aligned}\text{New balance} &= \text{balance due} + \text{credit charge} \\ &= 392.00 + 5.88 \\ &= 397.88\end{aligned}$$

The new balance is \$397.88.

$$\begin{aligned}
 21. \text{ New balance} &= \text{previous balance} + \text{interest} + \text{purchases} - \text{payments} \\
 &= 182.10 + 2.80 + 49.50 - 120.00 \\
 &= 114.40
 \end{aligned}$$

The new balance is \$114.40.

$$\begin{aligned}
 23. \text{ New balance} &= \text{previous balance} + \text{interest} + \text{purchases} - \text{payments} \\
 &= 493.72 + 9.72 + 247.50 - 250.00 \\
 &= 500.94
 \end{aligned}$$

The new balance is \$500.94.

b. Textbook questions 28 and 30 of “Applications and Problem Solving,” p. 556

28.

Month	Previous Balance	– Payment Made	+ Purchases Charged	→ Balance Due	+ Credit Charge	→ New Balance
October	\$138.53	\$100.00	\$223.85	\$262.38	\$3.28	\$265.66
November	\$265.66	\$150.00	\$158.37	\$274.03	\$3.43	\$277.46
December	\$277.46	\$150.00	\$418.44	\$545.90	\$6.82	\$552.72
January	\$552.72	\$300.00	\$42.10	\$294.82	\$3.69	\$298.51

30. a. Bank Loan

$$P = 1350, i = \frac{11\%}{2} = 0.055, \text{ and } n = 2 \times 2 = 4$$

$$\begin{aligned}
 \therefore A &= P(1+i)^n \\
 &= 1350(1+0.055)^4 \\
 &= 1672.41
 \end{aligned}$$

The cost of the bicycle using the bank loan is \$1672.41.

Section 2: Activity 1 (continued)

Store Offer

$$\begin{aligned}\text{Amount} &= 135 \times 12 \\ &= 1620\end{aligned}$$

The cost of the bicycle using the store's payment plan is \$1620.00.

An advantage of the bank loan is that the monthly payment is less. The payments are $\$1672.41 \div 24 = \$69.68$. A disadvantage of the bank loan is that the total cost of the bicycle is greater.

An advantage of the store's payment plan is that the total cost of the bicycle is less. A disadvantage of the store's payment plan is that the monthly payments are higher once the payments begin.

- b. For the bank loan, the interest is calculated on the entire loan, not on the outstanding balance.
6. The interest charges are not calculated in the same way on bank-card transactions as they are on retail accounts. With retail accounts, interest is calculated using a monthly interest rate $\times$ the balance due. With bank cards, interest is calculated on individual bank-card transactions—the daily interest rate $\times$ the amount of the transaction $\times$ the number of days the item was purchased before the end of the statement period.

7. Example 2

$$\begin{aligned}\text{rate per annum} &= \text{rate per month} \times \text{months per year} \\ &= 1.5 \times 12 \\ &= 18\end{aligned}$$

The annual interest rate in Example 2 is 18%.

Example 3

$$\begin{aligned}\text{rate per annum} &= \text{rate per day} \times \text{days per year} \\ &= 0.0504 \times 365 \\ &= 18.4\end{aligned}$$

The annual interest rate for Example 3 is 18.4%.

The interest rates in Example 2 and Example 3 are approximately the same.

8. a. Textbook questions 11, 13, 17, and 19 of “Practice,” p. 555

$$\begin{aligned} 11. \text{ Interest} &= 328.14 \times 0.00045 \times 30 \\ &= 4.43 \end{aligned}$$

The interest charge is \$4.43.

$$\begin{aligned} 13. \text{ Interest} &= 605.88 \times 0.00045 \times 14 \\ &= 3.82 \end{aligned}$$

The interest charge is \$3.82.

$$\begin{aligned} 17. \text{ Interest} &= 129.99 \times 0.00042 \times 18 \\ &= 0.98 \end{aligned}$$

The interest charge is \$0.98.

$$\begin{aligned} 19. \text{ Interest} &= 672.25 \times 0.00042 \times 10 \\ &= 2.82 \end{aligned}$$

The interest charge is \$2.82.

b. Textbook question 29 of “Applications and Problem Solving,” p. 556

$$\begin{aligned} 29. \text{ a. Interest on previous balance} &= 203.54 \times 0.000479 \times 31 \\ &= 3.02 \end{aligned}$$

$$\begin{aligned} \text{Interest on purchase posted Aug. 12} &= 75.00 \times 0.000479 \times 28 \\ &= 1.01 \end{aligned}$$

$$\begin{aligned} \text{Interest on purchase posted Aug. 13} &= 208.00 \times 0.000479 \times 27 \\ &= 2.69 \end{aligned}$$

$$\begin{aligned} \text{Interest on cash advance posted Sept. 6} &= 200.00 \times 0.000479 \times 3 \\ &= 0.29 \end{aligned}$$

$$\begin{aligned} \text{Total interest} &= 3.02 + 1.01 + 2.69 + 0.29 \\ &= 7.01 \end{aligned}$$

The total interest charge is \$7.01.

$$\begin{aligned} \text{b. Total purchases} &= 75.00 + 208.00 + 200.00 \\ &= 483.00 \end{aligned}$$

The total purchases are \$483.00.

$$\begin{aligned} \text{c. New balance} &= \text{previous balance} + \text{interest} + \text{purchases} - \text{payments} \\ &= 203.54 + 7.01 + 483.00 - 600.00 \\ &= 93.55 \end{aligned}$$

The new balance is \$93.55.

Section 2: Activity 1 (continued)

- d. Minimum payment = 3% of new balance

$$= 0.03 \times 93.55$$

$$= 2.81$$

The minimum payment, to the nearest dollar, is \$3.

- e. Interest for October statement = previous balance $\times$ daily rate $\times$ number of days

$$= 93.55 \times 0.000\ 479 \times 30$$

$$= 1.34$$

New balance = previous balance + interest charges – minimum payment

$$= 93.55 + 1.34 - 3.00$$

$$= 91.89$$

Interest from October 9 to November 5 = $91.89 \times 0.000\ 479 \times 27$

$$= 1.19$$

Balance to be paid on November 5 = $91.89 + 1.19$

$$= 93.08$$

The balance to be paid on November 5 is \$93.08.

Note: The text answer is \$93.07. Text answers may be dropping the part cent rather than rounding up.

9. Textbook questions 31 and 32 of “Applications and Problem Solving,” p. 556

31. If you regularly pay off your bank card before the due date, there is no interest charged. Some bank cards will deduct the payment before interest is calculated if you pay more than 50% of your bill before the due date.
32. Advantages of buying on credit are as follows:
- Desired items can be purchased and enjoyed immediately.
 - Credit cards provide customers with a convenient method of payment.
 - Credit cards serve as identification to places of business.
 - Use of credit provides customers with a credit rating, which may be used to their advantage in the future.

Disadvantages of buying on credit are as follows:

- Interest must be paid on the balance owed after the due date, indirectly making the final cost of items purchased on credit higher than cash purchases of the same items.
- Ease of purchasing may lead to overspending.

10. a. Textbook questions 1 to 5 and 7 of Investigation 1, “Converting Currencies,” p. 526

1. a.

Country	Currency
Greece	Drachma
Sweden	Krona
Denmark	Krone
Spain	Peseta

b. **Greece:** $\frac{1000}{0.051} = 196\,078.4314$

Therefore, CDN\$1000 is equivalent to 196 078 drachmas.

Sweden: $\frac{1000}{0.1923} = 5200.208\,008$

Therefore, CDN\$1000 is equivalent to 5200 kronor.

Denmark: $\frac{1000}{0.2309} = 4330.879\,168$

Therefore, CDN\$1000 is equivalent to 4331 kroner.

Note: Kronor is the plural form of krona, and kroner is the plural form of krone.

Spain: $\frac{1000}{0.0104} = 96\,153.846\,15$

Therefore, CDN\$1000 is equivalent to 96 154 pesetas.

2. $\frac{800}{1.5257} = 524.349\,478\,9$

Patricia receives US\$524.35 in exchange.

3. $25\,000 \times 1.5257 = 38\,142.5$

The price of the car is CDN\$38 142.50.

Section 2: Activity 1 (continued)

4. a. $25\,000 \times 2.5517 = 63\,792.5$

Lianne's inheritance is equivalent to CDN\$63 792.50.

b. $\frac{63\,792.50}{0.2621} = 243\,389.9275$

Lianne's inheritance is equivalent to 243 390 francs.

5. $500 \times 1.5257 = 762.85$

US\$500 is equivalent to CDN\$762.85.

$$\therefore \frac{762.85}{5} = 152.57$$

Remo can pay up to CDN\$152.57 for a room.

7. a. **Venezuela:** $\frac{100}{0.0026} = 38\,461.538\,46$

CDN\$100 is equivalent to 38 462 bolivars.

Argentina: $\frac{100}{1.5269} = 65.492\,173\,69$

CDN\$100 is equivalent to 65 pesos.

b. $3500 \times 0.0026 = 9.1$

Therefore, 3500 bolivars is equivalent to CDN\$9.10.

$$\frac{9.10}{1.5269} = 5.959\,787\,805$$

CDN\$9.10 is equivalent to 6 pesos.

Therefore, Lief will receive 6 pesos in Argentina for 3500 bolivars.

b. Textbook question 3 of Investigation 2, “Buying and Selling,” p. 526

3. a. When the value of the Canadian dollar increased, the price of Canadian goods exported to the United States increased.
- b. When the value of the Canadian dollar increased, the price of America goods exported to Canada decreased.

11. If purchasing a used car, Candace should consider the condition of the vehicle, have it inspected by a competent mechanic, and determine the cost of all necessary repairs. She should also investigate the fair-market value of similar vehicles and how easy it would be to sell the car if she finds, in the future, it does not meet her needs. She must also consider that most used cars are sold “as is,” meaning all future repair costs are her responsibility. Candace should also consider the number of kilometres on the vehicle; a high odometer reading may signal future repair bills or difficulty in resale.

Before Candace decides to lease a new car, she should explore the cost of purchasing that vehicle outright. If she intends to purchase the vehicle at the end of the lease, it is probably cheaper to purchase it now. Even with having to take out a loan to purchase the car, she will likely save money rather than leasing the car. She should also realize that if she does not purchase the car at the end of the leasing agreement, she will have nothing!

Before purchasing a new car, Candace should decide what optional features she wants on her vehicle. Then she should approach competing car dealers to obtain the best purchase price for that model. Also, she should examine the reliability and maintenance costs for that model, the warranties, and resale value.

12. Textbook questions 1 and 3 of Investigation 2, “Financing a Car Purchase,” p. 570

$$\begin{aligned} 1. \quad a. \quad \text{Amount financed} &= 12\,500 - 2\,500 \\ &= 10\,000 \end{aligned}$$

$$\begin{aligned} \text{Total monthly payments} &= 495 \times 24 \\ &= 11\,880 \end{aligned}$$

$$\begin{aligned} \text{Difference} &= 11\,880 - 10\,000 \\ &= 1\,880 \end{aligned}$$

Ghita will pay \$1880 extra for the car if she chooses this option.

Section 2: Activity 1 (continued)

b. $P = 10\,000$, $i = \frac{8.5\%}{4} = \frac{0.085}{4}$, and $n = 4 \times 2 = 8$

$$\begin{aligned}\therefore A &= P(1+i)^n \\ &= 10\,000 \left(1 + \frac{0.085}{4}\right)^8 \\ &= 11\,831.96\end{aligned}$$

$$\begin{aligned}\text{Monthly payment} &= \frac{11\,831.96}{24} \\ &= 493.00\end{aligned}$$

Ghita's monthly payment will be \$493.00.

- c. The bank loan will cost Ghita less.

Answers as to whether the cost of a bank loan is always less will vary. The cost of financing through a dealership or through a car manufacturer varies throughout the year and often depends on volume of sales at the time.

3. Answers may vary.

Advantages to leasing a car may include the following:

- monthly payment is low
- vehicle is always relatively new
- dealer looks after all maintenance

Disadvantages of leasing a car may include the following:

- long-term costs may be higher
- limited number of kilometres without additional cost

Section 2: Activity 2

- | | |
|------------------------|-------------------------------|
| 1. <u>vi.</u> mortgage | <u>i.</u> amortize |
| <u>ii.</u> mortgagor | <u>v.</u> amortization period |
| <u>iii.</u> mortgagee | <u>iv.</u> term of a mortgage |

2. a. Textbook questions a. and b. of “Explore: Use a Table,” p. 557

$$\begin{aligned}\text{a. monthly payment} &= 8.93 \times 120 \\ &= 1071.60\end{aligned}$$

Your monthly mortgage payment will be \$1071.60.

$$\begin{aligned}\text{b. monthly payment} &= 7.00 \times 120 \\ &= 840.00\end{aligned}$$

Your monthly mortgage payment will be \$840.

b. Textbook questions 1 to 4 of “Inquire,” p. 557

$$\begin{aligned}\text{1. monthly payment per thousand} &= \frac{670}{100} \\ &= 6.70\end{aligned}$$

From the table, the interest rate is 6.5%.

$$\begin{array}{ll}\text{2. monthly payment} = 7.41 \times 100 & \text{difference} = 741 - 670 \\ = 741 & = 71\end{array}$$

Your monthly payments would be \$71 more.

3. Option A's monthly payment per thousand is \$7.26; Option B's monthly payment per thousand is \$6.85. Therefore, Option B has the lower monthly payment.

4. A person might choose the shorter amortization period because the total to be repaid over the life of the loan would be less.

3. a. Textbook questions 1, 3, 9, and 11 of “Practice,” p. 560

$$\begin{aligned}\text{1. Down payment} &= 25\% \text{ of } 200\,000 \\ &= 0.25 \times 200\,000 \\ &= 50\,000\end{aligned}$$

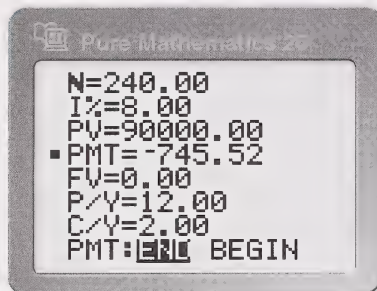
The down payment is \$50 000.

$$\begin{aligned}\text{3. Down payment} &= 5\% \text{ of } 99\,900 \\ &= 0.05 \times 99\,900 \\ &= 4995\end{aligned}$$

The down payment is \$4995.

Section 2: Activity 2 (continued)

9. Method 1: Using a Graphing Calculator



The monthly payment is \$745.52.

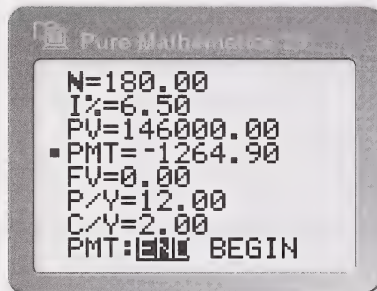
Method 2: Using a Table

$$\begin{aligned}\text{Monthly payment} &= 8.28 \times 90 \\ &= 745.20\end{aligned}$$

The monthly payment is \$745.20.

Note: Differences between methods occur because of rounding.

11. Method 1: Using a Graphing Calculator



The monthly payment is \$1264.90.

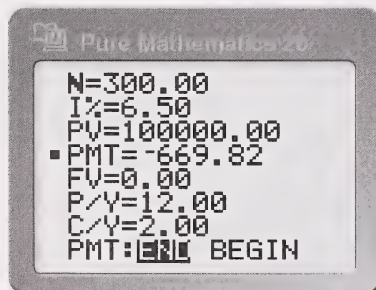
Method 2: Using a Table

$$\begin{aligned}\text{Monthly payment} &= 8.66 \times 146 \\ &= 1264.36\end{aligned}$$

The monthly payment is \$1264.36.

b. Textbook questions 26 and 27 of “Applications and Problem Solving,” p. 560

26. a. Method 1: Using a Graphing Calculator



The monthly payment is \$669.82.

Method 2: Using a Table

$$\begin{aligned}\text{Monthly payment} &= 6.70 \times 100 \\ &= 670\end{aligned}$$

The monthly payment is \$670.

b. Amount paid = $670 \times 25 \times 12$
 $= 201\,000$

The amount paid for the loan is \$201 000.

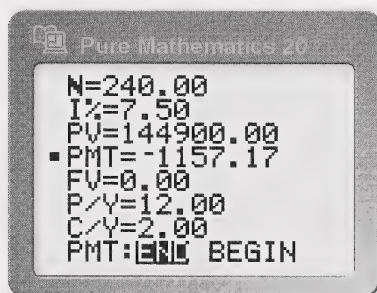
c. Interest = amount paid – amount of loan
 $= 201\,000 - 100\,000$
 $= 101\,000$

The amount of interest is \$101 000.

27. a. Amount financed = $199\,900 - 55\,000$
 $= 144\,900$

The amount financed is \$144 900.

b. Method 1: Using a Graphing Calculator



Sarah's monthly payment is \$1157.17.

4. a. Textbook questions 14, 15, 18, 20, and 22 of "Practice," p. 560

14. Annual property tax = $\frac{\text{assessed value}}{1000} \times \text{mill rate}$
 $= \frac{79\,000}{1000} \times 32.0665$
 $= 2533.25$

The annual property tax is \$2533.25.

If you used the graphing calculator in question 26.a., then

Amount paid = $669.82 \times 25 \times 12$
 $= \$200\,946$

If you used the graphing calculator in question 26.a., then

Interest = $200\,946 - 100\,000$
 $= \$100\,946$

Method 2: Using a Table

Monthly payment = 7.99×144.9
 $= 1157.75$

Sarah's monthly payment is \$1157.75.

Section 2: Activity 2 (continued)

$$\begin{aligned}
 15. \quad \text{Annual property tax} &= \frac{\text{assessed value}}{1000} \times \text{mill rate} \\
 &= \frac{152\,800}{1000} \times 32.0665 \\
 &= 4899.76
 \end{aligned}$$

The annual property tax is \$4899.76.

$$\begin{aligned}
 18. \quad \text{Annual property tax} &= \frac{\text{assessed value}}{1000} \times \text{mill rate} \\
 &= \frac{426\,500}{1000} \times 32.0665 \\
 &= 13\,676.36
 \end{aligned}$$

The annual property tax is \$13 676.36.

$$\begin{aligned}
 20. \quad \text{Annual property tax} &= \frac{\text{assessed value}}{1000} \times \text{mill rate} \\
 &= \frac{4\,235\,000}{1000} \times 42.0061 \\
 &= 177\,895.83
 \end{aligned}$$

The annual property tax is \$177 895.83.

$$\begin{aligned}
 22. \quad \text{Annual property tax} &= \frac{\text{assessed value}}{1000} \times \text{mill rate} \\
 &= \frac{27\,500\,000}{1000} \times 42.0061 \\
 &= 1\,155\,167.75
 \end{aligned}$$

The annual property tax is \$1 155 167.75.

b. Textbook questions 30, 32, and 33 of “Applications and Problem Solving,” pp. 560 and 561

$$\begin{aligned}
 30. \quad \text{a.} \quad \text{Annual property tax} &= \frac{107\,850}{1000} \times 15.1888 \\
 &= 1638.11
 \end{aligned}$$

The annual property tax is \$1638.11.

$$\begin{aligned}\text{b. School portion of tax} &= \frac{107\,850}{1000} \times 7.1084 \\ &= 766.64\end{aligned}$$

The schools received \$766.64.

$$\begin{aligned}\text{32. a. Annual property tax} &= \frac{354\,000}{1000} \times 6.54515 \\ &= 2316.98\end{aligned}$$

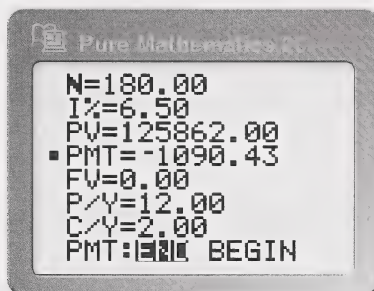
$$\begin{aligned}49\% \text{ of } 2316.98 &= 0.49 \times 2316.98 \\ &= 1135.32\end{aligned}$$

The municipality received \$1135.32.

$$\text{b. } 43\% \text{ of } 2316.98 = 0.43 \times 2316.98$$

The schools received \$996.30.

33. Use the Financial features on your graphing calculator to find the mortgage payment.



The monthly mortgage payment is \$1090.43.

$$\begin{aligned}\text{Annual property tax} &= \frac{185\,000}{1000} \times 8.3015 & \text{Monthly property tax} &= \frac{1535.78}{12} \\ &= 1535.78 & &= 127.98\end{aligned}$$

$$\begin{aligned}\text{Monthly housing costs} &= 1090.43 + 127.98 \\ &= 1218.41\end{aligned}$$

Mala's monthly housing costs are \$1218.41.

Section 2: Activity 2 (continued)

5. Additional costs for renting an apartment:

- power
- rental insurance

Additional costs for renting a house:

- utilities—power, water, sewer, heat
- rental insurance

Additional costs for buying a house:

- utilities—power, water, sewer, heat
- taxes
- repairs and maintenance
- house insurance

Note: Services such as cable and telephone have not been considered.

6. Textbook question 39 of “Applications and Problem Solving,” p. 561

39. a. Equity is the amount of money a home is worth beyond what is owed on it.
- b. Home-owners can increase their equity in their home by making extra payments, in addition to the monthly mortgage payment, toward their mortgage as specified in the contract. This additional money goes directly to paying off the principal on the mortgage, thus increasing the owner's equity in the property. A home-owner's equity can also increase when the value of their property goes up.
- c. Equity in a home could decrease if the value of the property decreases.

Section 2: Activity 3

1. A budget is a plan of how one's money will be spent. A balanced budget is a budget in which revenue equals expenses.
2. a. Textbook questions a. and b. of “Explore: Interpret the Graph,” p. 562
- a. The most money was spent on elderly benefits.
- b. The least money was spent on crown corporations.

b. Textbook questions 1 to 5 of “Inquire,” p. 562

1. a. Amount = 12.2% of 140
 $= 0.122 \times 140$
 $= 17.08$

The amount spent on EI benefits was \$17.08 billion.

- b. Amount = 7.8% of 140
 $= 0.078 \times 140$
 $= 10.92$

The amount spent on defence was \$10.92 billion.

2. Answers may vary. A sample answer is given.

Services included in a provincial budget that are not included in a federal budget are as follows:

- social services
- health care
- major highway construction
- elementary and secondary education

Services included in a municipal budget that are not included in a federal budget are as follows:

- school operation
- local road construction and maintenance
- law enforcement
- recreational services

3. Answers may vary. A sample answer is given.

Sources of money for the federal government's budget are as follows:

- federal income tax
- GST
- various forms of taxation (e.g., consumption taxes)
- Employment Insurance contributions

Sources of money for a provincial government's budget are as follows:

- provincial income tax
- revenue from natural resources
- fuel taxes
- federal grants

Sources of money for a municipal government's budget are as follows:

- property taxes
- provincial grants

4. Government budgets allow Canadians to know how their government is spending money and whether the government is spending within their means. Also, government budgets are an essential part of the planning process for each fiscal year.

Section 2: Activity 3 (continued)

5. A circle graph provides a picture showing how each part of the budget compares to the others and to the whole budget.

3. a. Textbook questions 1, 3, 4, 6, 8, 14, 15, 16, and 20 of “Practice,” p. 565

- | | |
|--|--------------------------------|
| 1. variable expense, education/reading | 3. fixed expense, shelter |
| 4. fixed expense, utilities | 6. variable expense, food |
| 8. occasional expense, gifts | 14. variable expense, clothing |
15. The budget is balanced.
16. The budget has a surplus.

$$\frac{(25\,649.50 - 23\,981.40)}{25\,649.50} \times 100\% = \frac{1668.10}{25\,649.50} \times 100\% = 6.5\%$$

The surplus amount, as a percent of the total income, is 6.5%.

20. a.

	A	B	C	D
1	Aisha's Monthly Budget Statement			
2	Income			
3	Item	Amount		
4	Net monthly income	\$2,358.00		
5	Total	\$2,358.00		
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	Item	Amount	Item	Amount
10	Rent	\$600.00	Food	\$400.00
11			Transportation	\$85.00
12			Telephone	\$43.00
13			Clothing	\$200.00
14			Entertainment	\$250.00
15	Total	\$600.00	Total	\$978.00
16				
17	Total Expenditures	\$1,578.00		
18				
19	Balance	\$780.00		

- b. Aisha saves \$780 each month.

b. Textbook question 22 of “Applications and Problem Solving,” p. 565

22. a.

	A	B	C	D	E	F
1		Item				
2	Month	Hydro	Gas	Food	TV	Phone
3	Jan	\$92.00	\$120.00	\$422.00	\$22.00	\$35.00
4	Feb	\$88.00	\$140.00	\$453.00	\$22.00	\$35.00
5	Mar	\$82.00	\$110.00	\$422.00	\$22.00	\$35.00
6	Apr	\$70.00	\$90.00	\$426.00	\$22.00	\$35.00
7	May	\$64.00	\$58.00	\$464.00	\$22.00	\$35.00
8	Jun	\$66.00	\$32.00	\$422.00	\$22.00	\$35.00
9	Jul	\$41.00	\$22.00	\$422.00	\$22.00	\$35.00
10	Aug	\$56.00	\$18.00	\$422.00	\$22.00	\$35.00
11	Sep	\$72.00	\$56.00	\$422.00	\$22.00	\$35.00
12	Oct	\$84.00	\$83.00	\$422.00	\$22.00	\$35.00
13	Nov	\$86.00	\$100.00	\$378.00	\$22.00	\$35.00
14	Dec	\$122.00	\$140.00	\$247.00	\$22.00	\$35.00
15						
16	Average	\$76.92	\$80.75	\$410.17	\$22.00	\$35.00
17	Maurice's Share	\$25.64	\$26.92	\$136.72	\$7.33	\$11.67

b.

	A	B	C	D
1	Maurice's Monthly Budget Statement			
2	Income			
3	<i>Item</i>	<i>Amount</i>		
4	Net monthly income		\$2,415.76	
5	Total		\$2,415.76	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Rent	\$400.00	Food	\$136.72
11	Hydro	\$25.64	Transportation	\$120.00
12	Gas	\$26.92	Telephone	\$11.67
13	TV	\$7.33	YMCA membership	\$30.00
14	Student loan	\$125.00		
15	Total	\$584.89	Total	\$298.39
16				
17	Total Expenditures	\$883.28		
18				
19	Balance	\$1,532.48		

c. $\frac{1532.48}{3} = 510.83$

Maurice will budget \$510.83 for each item.

Section 2: Activity 3 (continued)

4. The expense item that appears to be missing from Daniel's revised budget is car insurance. Car insurance is a fixed expense if you operate a motor vehicle. Daniel may be able to get the money for car insurance from the amount allocated for entertainment and for snacks.
5. Textbook questions 21, 23, 25, and 26 of "Applications and Problem Solving," pp. 565 and 566

$$21. \text{ a. } 2745 - (500 + 35 + 100 + 35 + 300 + 400 + 300 + 250 + 150) = 2745 - 2070 \\ = 675$$

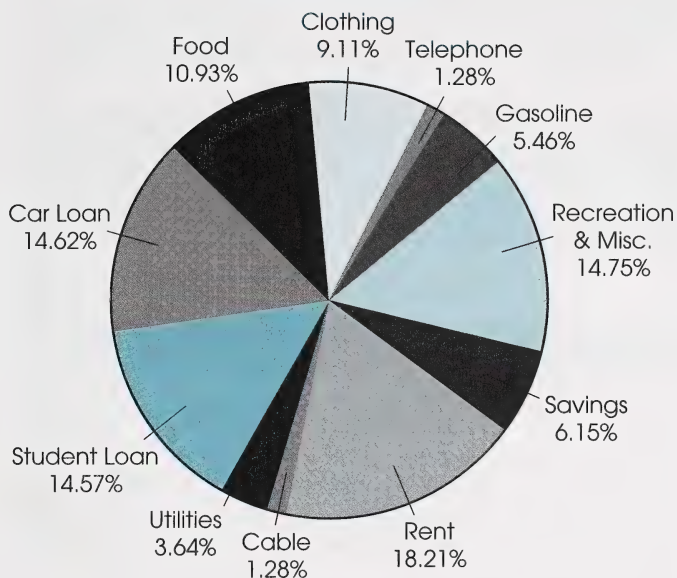
Holly will have \$675 left.

b.

	A	B	C	D
1	Holly's Monthly Budget Statement			
2	Income			
3	<i>Item</i>	<i>Amount</i>		
4	Net monthly income		\$2,745.00	
5	Total		\$2,745.00	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Rent	\$500.00	Food	\$300.00
11	Cable	\$35.00	Clothing	\$250.00
12	Utilities	\$100.00	Telephone	\$35.00
13	Car loan	\$401.25	Gasoline	\$150.00
14	Student loan	\$400.00	Recreation & misc.	\$405.00
15	Total	\$1,436.25	Total	\$1,140.00
16				
17	Total Expenditures	\$2,576.25		
18	Savings	\$168.75		
19	Balance	\$0.00		

c.

Holly's Budget



23. a. Answers may vary. A sample of Linda's Annual Budget Statement is given.

	A	B	C	D
1	Linda's Annual Budget Statement			
2	Income			
3	<i>Item</i>	<i>Amount</i>		
4	Net annual income		\$25,680.00	
5	Total		\$25,680.00	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Rent	\$6,420.00	Food	\$3,852.60
11	Utilities	\$300.00	Clothing	\$2,054.00
12	Car loan	\$4,821.00	Telephone	\$600.00
13			Gasoline	\$2,000.00
14			Entertainment	\$1,797.00
15			Vacation	\$2,500.00
16	Total	\$11,541.00	Total	\$12,804.60
17				
18	Total Expenditures	\$24,345.60		
19	Savings	\$1,334.40		
20	Balance	\$0.00		

Section 2: Activity 3 (continued)

b. Answers may vary. A sample of Liam's Monthly Budget Statement is given.

	A	B	C	D
1	Liam's Monthly Budget Statement			
2	Income			
3	<i>Item</i>	<i>Amount</i>		
4	Net monthly income		\$1,700.00	
5	Total		\$1,700.00	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Rent	\$170.00	Food	\$255.00
11	Utilities	\$12.50	Clothing	\$136.00
12	Visa payment	\$100.00	Telephone	\$17.50
13	Loan payment (ski trip)	\$100.00	Recreation & misc.	\$300.00
14	Total	\$382.00	Total	\$708.50
15				
16	Total Expenditures	\$1,091.00		
17	Savings	\$609.00		
18	Balance	\$0.00		

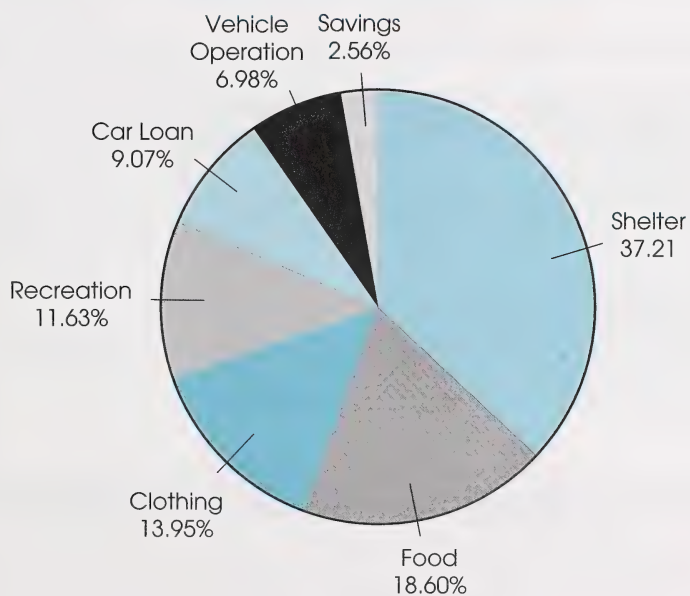
25. a.

	A	B	C	D
1	Kostas's Monthly Budget Statement			
2	Income			
3	<i>Item</i>	<i>Amount</i>		
4	Net monthly income		\$2,000.00	
5	Total		\$2,000.00	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Shelter	\$800.00	Food	\$400.00
11			Clothing	\$300.00
12			Transportation	\$100.00
13			Recreation	\$250.00
14	Total	\$800.00	Total	\$1,050.00
15				
16	Total Expenditures	\$1,850.00		
17	Savings	\$150.00		
18	Balance	\$0.00		

b.

	A	B	C	D
1	Kostas's Monthly Budget Statement			
2	Income			
3	<i>Item</i>		<i>Amount</i>	
4	Net monthly income		\$2,150.00	
5	Total		\$2,150.00	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	<i>Item</i>	<i>Amount</i>	<i>Item</i>	<i>Amount</i>
10	Shelter	\$800.00	Food	\$400.00
11	Car loan	\$195.00	Clothing	\$300.00
12			Recreation	\$250.00
13			Vehicle operation	\$150.00
14	Total	\$995.00	Total	\$1,100.00
15				
16	Total Expenditures	\$2,095.00		
17	Savings	\$55.00		
18	Balance	\$0.00		

c.

Kostas's Monthly Budget of \$2150

Section 2: Activity 3 (continued)

26. Answers may vary. A sample answer is given.

“Everyone’s budget must reflect their income and their lifestyle.”

I agree with this statement. Everyone has different needs and wants and a different income from which to satisfy these needs and wants. Where you live, the type of car you drive, the furnishings you have in your home, and so on must be purchased from the income you earn. You need to try to live within the income you earn rather than trying to keep up with friends or neighbours by using credit cards excessively.

6. Textbook question 29 of “Applications and Problem Solving,” p. 566

29. Answers may vary. You should try to include expenditures that are suited to the situation and balance the budget.

Section 2: Activity 4

1. Textbook questions 1 to 4 of Investigation 1, “Comparing Unit Prices,” p. 524

1. a. The term *unit price* means the price of a single item or the price of one unit of an item.

b.

Item	Size	Price	Unit Price (\$/mL)	
Olive Oil	250 mL	\$3.60	0.0144	← $\$3.60 \div 250 \text{ mL}$
	500 mL	\$5.99	0.01198	← $\$5.99 \div 500 \text{ mL}$
Tomato Ketchup	375 mL	\$1.99	0.005306667	← $\$1.99 \div 375 \text{ mL}$
	1.25 L	\$4.49	0.003592	← $\$4.49 \div 1250 \text{ mL}$
Orange Juice	946 mL	\$1.89	0.001997886	← $\$1.89 \div 946 \text{ mL}$
	1.89 L	\$3.19	0.001687831	← $\$3.19 \div 1890 \text{ mL}$
Bleach	900 mL	\$1.29	0.001433333	← $\$1.29 \div 900 \text{ mL}$
	1.8 L	\$1.69	0.000938889	← $\$1.69 \div 1800 \text{ mL}$

- c. In some cases, it is quite obvious which is the better buy. For example, the 1.8 L of bleach is double in size but not in price. Also, the 500 mL of olive oil is double in size but not in price.
2. In each case, the larger size is the better value.
3. a. The larger the size of the item, the lower the unit price.
- b. Production costs, in particular packaging, are lower with larger-sized items.

4. Two reasons why a person may not buy the larger size of a product are as follows:

- A person may not use up the larger size before it spoils.
- A person may not have enough storage space for the larger sizes.

2. Textbook questions 1 to 4 of Investigation 2, “Buying at a Supermarket,” p. 524

1.

	Unit Price (\$)			
	Bagels	Oranges	Detergent	Cream Cheese
Quality Store	0.33	0.25	1.00	0.0076
EconoFoods	0.22	0.23	0.97	0.0085
Foodmart	0.20	0.25	1.15	0.0072

Foodmart has the best buy for bagels and cream cheese; EconoFoods has the best buy for oranges and detergent.

- You are assuming that the quality of the products are the same and that the sizes of the items, such as bagels and oranges, are the same.
- Some factors to consider, other than price, are quality, selection, and the store’s return policy.
- Other factors that may affect a customer’s decision to choose one store over another are selection, consistency of supply, return policy, courtesy of staff, hours of operation, and location.

3. Answers may vary. In your discussion, you should include why you may need to adjust your budget and how comparison shopping and an understanding of unit prices will help you adjust your budget to help you fulfill your goal.

Section 2: Follow-up Activities

Extra Help

1.

	A	B	C	D	E	F	G
1	Month	Previous Balance (+)	Payment (–)	Purchases (+)	Balance Due (=)	Credit Charge (+ 1.8%)	New Balance (=)
2	January	\$385.60	\$200.00	\$134.76	\$320.36	\$5.77	\$326.13
3	February	\$326.13	\$200.00	\$231.25	\$357.38	\$6.43	\$363.81
4	March	\$363.81	\$200.00	\$178.99	\$342.80	\$6.17	\$348.97
5	April	\$348.97	\$200.00	\$84.50	\$233.47	\$4.20	\$237.67
6	May	\$237.67	\$200.00	\$190.69	\$228.36	\$4.11	\$232.47

Extra Help (continued)

2. a.

	A	B
1	Property Tax	
2		
3	Mill Rate	36.75
4	Assessment	Amount of Tax
5	\$127,900.00	\$4,700.33
6	\$98,500.00	\$3,619.88
7	\$239,000.00	\$8,783.25
8	\$113,700.00	\$4,178.48

b. When entering the formula for the amount of tax, enter “\$ cell letter \$ cell number” for the cell with the mill rate instead of just the cell letter and cell number.

3. Answers will vary. A sample spreadsheet is given.

	A	B	C	D
1	Tony's Monthly Budget			
2	Income			
3	Item		Amount	
4	Net monthly income		\$1,965.70	
5	Total		\$1,965.70	
6				
7	Expenditures			
8	Fixed Expenses		Variable Expenses	
9	Item	Amount	Item	Amount
10	Rent	\$450.00	Food	\$300.00
11			Clothing	\$200.00
12			Telephone	\$43.00
13			Transportation	\$285.00
14			Entertainment	\$250.00
15	Total	\$450.00	Total	\$1,078.00
16				
17	Total Expenditures	\$1,528.00		
18	Savings	\$437.70		
19	Balance	\$0.00		

Enrichment

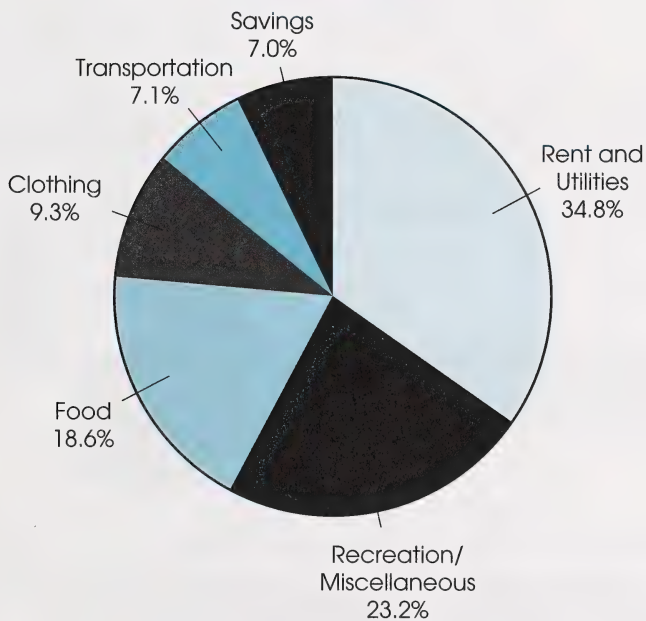
1. Textbook question 24 of “Applications and Problem Solving,” p. 566

24. a.

Item	Budgeted Amount	Percent of Total
Rent and Utilities	\$750.00	34.8%
Food	\$400.00	18.6%
Clothing	\$200.00	9.3%
Transportation	\$153.60	7.1%
Savings	\$150.00	7.0%
Recreation /Miscellaneous	\$500.00	23.2%

b.

Carlos's Budget



Enrichment (continued)

c.

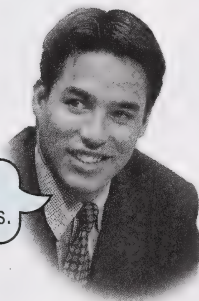
Item	Budgeted Amount	Actual Amount	Variance
Rent and Utilities	\$750.00	\$776.41	– \$26.41
Food	\$400.00	\$362.50	+ \$37.50
Clothing	\$200.00	\$261.69	– \$61.69
Transportation	\$153.60	\$148.00	+ \$5.60
Savings	\$150.00	\$150.00	+ \$0.00
Recreation /Miscellaneous	\$500.00	\$455.00	+ \$45.00

2. Answers may vary. Your budget can be based on money earned from a part-time job or from allowance money.

Spreadsheets

The following information will help you if you have never used a spreadsheet before or if you need to review its capabilities.

A spreadsheet is a computer-generated arrangement of data in rows and columns.



When you open a new spreadsheet document, a grid of **columns** and **rows** will appear.

	A	B	C	D
1				
2				
3				
4				

The top of the grid contains the column headings (labelled A, B, C, ...). The left side of the grid contains the row headings (labelled 1, 2, 3, 4, ...).

A **cell** is formed at the intersection of each column and row. For example, the cell at the intersection of column A and row 1 is identified as cell A1. The notation A1 is the **cell address**. You will use the cell address when you write spreadsheet formulas.

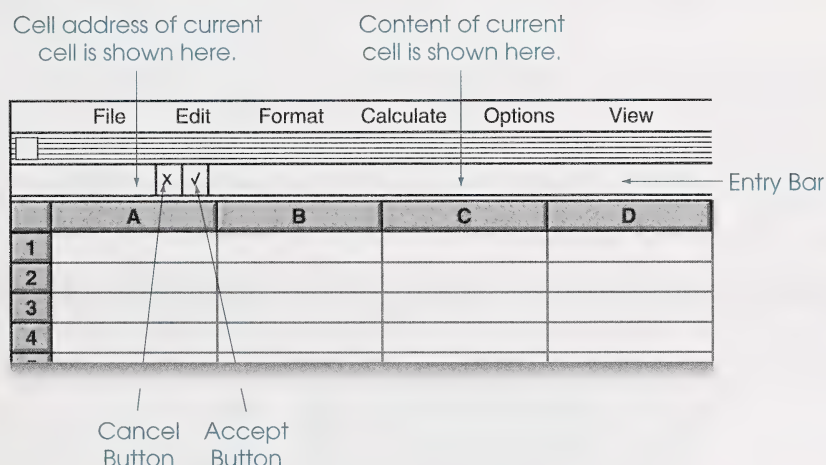
The active or selected cell is called the **current cell**. The current cell has a border around it. In a new document, cell A1 is the current cell.

You can select another cell by clicking on that cell.

You can also move around the spreadsheet in the following ways:

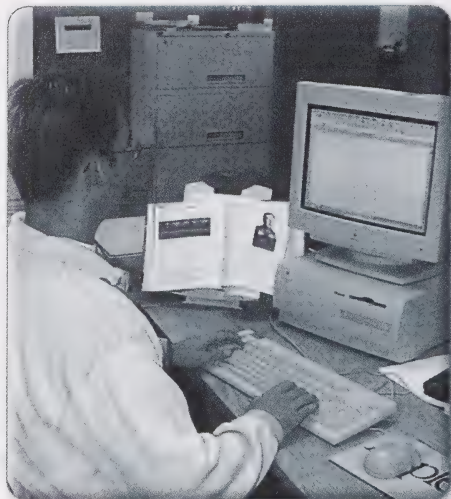
- The “return” key (or “enter” key) moves the selection one cell down.
- The “tab” key moves the selection one cell to the right.
- The arrow keys move the selection one cell in the direction of the arrow.

You use the **entry bar** to enter data in a spreadsheet. The entry bar is above the column headings. It identifies the cell address and the contents of the current cell.



To enter data in a cell, select a cell and type the data, but do **not** press “return.” The data will appear in the entry bar as you type. (If you make an error, you can backspace to make the correction.) Confirm the entry by clicking on the **accept button** or by pressing “return.” When you confirm the entry, data in the entry bar is displayed in the cell.

If the data will not fit into a cell, you can resize the column. One way to do this is to drag the right edge of the column heading with the mouse.



Spreadsheet formulas show how two or more cells are related. Here are some points to remember about spreadsheet formulas:

- Always begin a spreadsheet formula with an equals sign (=).
- Use cell addresses instead of variables in spreadsheet formulas.
- Use an asterisk (*) for multiplication.
- Use a forward slash (/) for division.

For example, to find the sum of the values in cells B5 and B6, you would use the following formula:

$=B5+B6$

To find the product of cells A1 and B3, you would use the following formula:

$=A1*B3$

You will now look into the process of preparing and modifying tables using computer spreadsheets. In previous years, you may have used tables that were created using spreadsheets. An electronic spreadsheet allows you to organize data in rows and columns. Each cell in a spreadsheet can contain words, numbers, or formulas. You will discover how to modify spreadsheet tables by entering new numbers or formulas in cells in order to test and model different scenarios. For example, you will look at loan payments—how they change when the interest rate changes or when the length of the loan changes.

Recall that the examples in Pure Mathematics 20 use *ClarisWorks™ 4.0*. Even though most spreadsheets are similar, if you have a different spreadsheet program on your computer, you may have to consult the user's guide to adapt the steps outlined.

The following example illustrates how interest can be calculated and entered and how opening and closing balances can be entered in a spreadsheet.



Example

Claudia has negotiated an \$80 000 loan. The annual interest rate is 7%. With a fixed annual payment of \$13 397.42, she will pay off the loan in 8 years. Set up a spreadsheet, similar to the following, that calculates the opening balance, the interest charged, and the closing balance for each year.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance
2	1	\$80,000.00	7.00%		\$13,397.42	
3	2		7.00%		\$13,397.42	
4	3		7.00%		\$13,397.42	
5	4		7.00%		\$13,397.42	
6	5		7.00%		\$13,397.42	
7	6		7.00%		\$13,397.42	
8	7		7.00%		\$13,397.42	
9	8		7.00%		\$13,397.42	

Solution

Step 1: Open a new spreadsheet.

Step 2: Type the headings in cells A1 through to F1 (as shown). You may wish to bold the headings in order to set them apart visually from the data.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance

Note: You may have to adjust the column widths and the row heights to accommodate the text. Consult the user's guide for details.

Step 3: Select column B by clicking on the header. Now, click on the Format menu and select "Number..."; then select "Currency." This will express all values in column B in dollars and cents.

Do the same for columns D, E, and F, since the interest, annual payment, and closing balance should also be expressed in dollars and cents.

Step 4: Select column C by clicking on the header. Now, click on the Format menu and select "Number..."; then select "Percent." This will express all values in column C as a percent. **Note:** This means that whenever you enter a percentage in this column, you must type in the decimal equivalent of that percent. For example, to insert 7% in cell C2, you must enter "0.07" ($7\% = 0.07$).

Step 5: Enter the following values for the first year. Format cells wherever calculations occur.

- In cell A2, enter “1” to represent the first year of the loan.
- In cell B2, enter “80000”, since the opening balance of the loan is \$80 000.
- In cell C2, enter “0.07”, since the annual interest rate is 7%.
- In cell D2, you want to calculate the interest for the year, which is the product of B2 and C2. To do this, enter the formula, “=B2*C2” and press “enter” or click on the Accept button (☒). (“\$5600.00” will appear.)
- In cell E2, enter “13397.42”, since Claudia will make an annual payment of \$13 397.42.
- In cell F2, you want to calculate the year’s closing balance. To do this, enter the formula “=B2+D2-E2” and press “enter.” (“\$72202.58” will appear.)

Your spreadsheet should look like the following.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance
2	1	\$80,000.00	7.00%	\$5,600.00	\$13,397.42	\$72,202.58

Step 6: Format the next row in order to calculate the information for the second year of the loan. Do the following:

- In cell A3, enter the formula “=A2+1” so it shows that it is the following year.
- In cell B3, enter the formula “=F2”, since the opening balance for the second year is the same as the closing balance of the first year.
- In cell C3, enter “=C2”, since the annual interest rate is the same as the preceding year.
- In cell D3, enter the formula “=B3*C3” to calculate the interest for the second year.
- In cell E3, enter “=E2”, since the annual payment is the same as the preceding year.
- In cell F3, enter the formula “=B3+D3-E3” to calculate the closing balance for the second year.

Your spreadsheet should look like the following.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance
2	1	\$80,000.00	7.00%	\$5,600.00	\$13,397.42	\$72,202.58
3	2	\$72,202.58	7.00%	\$5,054.18	\$13,397.42	\$63,859.34

Step 7: Complete the spreadsheet for the 8-year loan. Highlight cells A3 to F9; then click on the Calculate menu and select "Fill Down."

Your spreadsheet should look like the following.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance
2	1	\$80,000.00	7.00%	\$5,600.00	\$13,397.42	\$72,202.58
3	2	\$72,202.58	7.00%	\$5,054.18	\$13,397.42	\$63,859.34
4	3	\$63,859.34	7.00%	\$4,470.15	\$13,397.42	\$54,932.07
5	4	\$54,932.07	7.00%	\$3,845.25	\$13,397.42	\$45,379.90
6	5	\$45,379.90	7.00%	\$3,176.59	\$13,397.42	\$35,159.07
7	6	\$35,159.07	7.00%	\$2,461.14	\$13,397.42	\$24,222.79
8	7	\$24,222.79	7.00%	\$1,695.60	\$13,397.42	\$12,520.96
9	8	\$12,520.96	7.00%	\$876.47	\$13,397.42	\$0.01

Note that there is a balance of \$0.01 at the end of year 8. Simply adjust the final payment so that year 8 shows a zero balance.

Your spreadsheet should look like the following.

	A	B	C	D	E	F
1	Year	Opening Balance	Annual Interest Rate	Interest	Annual Payment	Closing Balance
2	1	\$80,000.00	7.00%	\$5,600.00	\$13,397.42	\$72,202.58
3	2	\$72,202.58	7.00%	\$5,054.18	\$13,397.42	\$63,859.34
4	3	\$63,859.34	7.00%	\$4,470.15	\$13,397.42	\$54,932.07
5	4	\$54,932.07	7.00%	\$3,845.25	\$13,397.42	\$45,379.90
6	5	\$45,379.90	7.00%	\$3,176.59	\$13,397.42	\$35,159.07
7	6	\$35,159.07	7.00%	\$2,461.14	\$13,397.42	\$24,222.79
8	7	\$24,222.79	7.00%	\$1,695.60	\$13,397.42	\$12,520.96
9	8	\$12,520.96	7.00%	\$876.47	\$13,397.43	\$0.00

